



Use less energy—and get a performance boost

We measured general, graphics, and AI performance and monitored power consumption while running resource-intensive workloads on HP Elite SFF 805 G9 Desktop PCs powered by AMD Ryzen PRO processors and Dell OptiPlex SFF Plus Desktops powered by Intel vPro with Intel Core processors

Whether your organization is ready to add artificial intelligence (AI) innovations and machine learning (ML) workloads to your operations or not, the increasing amount of data across industries is a game changer. And the more effectively your teams can transform data such as edge data, medical records, POS metrics, and security footage into actionable insights, the more likely you can be to meet and exceed your long-term goals. The introduction of a neural

processing unit (NPU) to traditional CPU and GPU computer architecture is also a potential game changer. An NPU, at its low-energy-consumption core, can help accelerate AI and ML workloads.¹ Moving forward, this makes it imperative to choose the right combination of processor components and RAM for your commercial desktops.

In our hands-on tests, we used industry-standard benchmarks to compare small form factor (SFF) AMD Ryzen™ processor-powered HP Elite and Intel® Core™ processor-powered Dell™ OptiPlex™ commercial desktop systems. We found that HP Elite SFF 805 G9 Desktop PCs powered by an AMD Ryzen PRO 8600G or 8700G processor with built-in Ryzen AI NPU outperformed Dell OptiPlex SFF Plus Desktops with an Intel vPro® with Intel Core i5-14500 or i7-14700 processor in all comparisons. We also found that both versions of the AMD Ryzen 8000 Series PRO processor-powered HP Elite SFF 805 G9 Desktop PC we tested used less energy than either Intel vPro with Intel Core processor-powered Dell OptiPlex SFF Plus Desktop during resource-intensive video call presentations.



Consume less power during resource-intensive activities

Up to 28.8% less power consumption during a 30-minute Microsoft Teams presentation*



Empower graphics-intensive workloads

Up to 244.6% higher 3DMark® Time Spy overall score**



Run AI and ML applications more efficiently

Up to 408.4% higher Geekbench AI Quantized score**

This project was commissioned by HP and AMD.

* HP Elite SFF 805 G9 Desktop PC powered by an AMD Ryzen 5 PRO 8600G processor and 16GB RAM vs. Dell OptiPlex SFF Plus Desktop powered by Intel vPro with Intel Core i5-14500 processor and 16GB RAM

**HP Elite SFF 805 G9 Desktop PC powered by an AMD Ryzen 7 PRO 8700G processor and 32GB RAM vs. Dell OptiPlex SFF Plus Desktop powered by Intel vPro with Intel Core i7-14700 processor and 32GB RAM

How we tested

A system's central processing unit (CPU), graphics processing unit (GPU), random access memory (RAM), and storage all play an important part in performance. We equipped each system with the best processor configurations available at the time of testing. It is worth noting that the AMD Ryzen 8000G Series processors in the HP Elite SFF 805 G9 Desktop PCs include built-in Ryzen AI NPUs. The Intel Core i5 and i7 processors in the Dell OptiPlex SFF Plus Desktops don't have NPUs; at the time of testing, Intel processors with NPUs were not available for these Dell OptiPlex desktops. Because we compared AI and ML capabilities as well as processor performance, we loaded up each Windows 11 Pro test system with either 16 or 32 GB of DDR5-5600 RAM, memory that is helpful for data-heavy applications and workflows. And, because we wanted to make sure there was enough on-system storage to run our tests, we equipped all systems with 512 GB of SSD storage.

Systems equipped with 16GB RAM

HP Elite SFF 805 G9 Desktop PC

- AMD Ryzen 5 PRO 8600G processor
- Integrated AMD Radeon™ 760M Graphics

Dell OptiPlex SFF Plus Desktop

- Intel vPro with Intel Core i5-14500 processor
- Integrated Intel UHD 770 Graphics



Systems equipped with 32GB RAM

HP Elite SFF 805 G9 Desktop PC

- AMD Ryzen 7 PRO 8700G processor
- Integrated AMD Radeon 760M Graphics

Dell OptiPlex SFF Plus Desktop

- Intel vPro with Intel Core i7-14700 processor
- Integrated Intel UHD 770 Graphics

We evaluated the systems' general, graphics, and AI performance using these benchmarking tools:

- 3DMark
- Geekbench AI
- LM Studio
- PassMark PerformanceTest 11
- Procyon® AI Computer Vision Benchmark
- Procyon Photo Editing Benchmark
- Procyon Video Editing Benchmark

We also monitored power consumption during a 30-minute Microsoft Teams video meeting that included a large Microsoft PowerPoint presentation.

The results we report reflect the specific configurations we tested. Any difference in the configurations—as well as screen brightness, network traffic, and software additions—can affect these results. For a deeper dive into our testing parameters and procedures, see the [science behind the report](#).

Which is the right memory investment for you moving forward: 16GB or 32GB?

The demand for memory in devices continues to change with the increasing complexity of software. Investing in systems with more powerful processors and memory can help workers who jump between online meetings, multi-tab browsing, and media streaming activities.

General productivity: 16 GB of RAM is adequate for standard business professionals who tend to have several programs open and running. 32 GB of RAM is more appropriate for engineers, scientists, and entry-level multimedia users.

AI integration: An appropriate amount of RAM is essential in AI workloads “because it utilizes the temporary storage space where data is stored while the AI system actively uses it.”² The more data an AI workload can access and analyze in a given period of time, the more accurate the answers should be.

Multitasking: Investing in systems with more powerful processors and memory can provide noticeable performance boosts for knowledge workers who are multitasking or working with large files. More RAM can also help workers who browse in multiple tabs, tackle challenging workloads, and regularly stream media.

Comparison 1 (16GB RAM)

HP Elite SFF 805 G9 Desktop PC
AMD Ryzen 5 PRO 8600G Processor

Dell OptiPlex SFF Plus Desktop
Intel vPro with Intel Core i5-14500 Processor

Comparison 2 (32GB RAM)

HP Elite SFF 805 G9 Desktop PC
AMD Ryzen 7 PRO 8700G Processor

Dell OptiPlex SFF Plus Desktop
Intel vPro with Intel Core i7-14700 Processor



About HP Elite SFF 805 G9 Desktop PCs

These compact commercial desktop PCs come with AMD Ryzen 8000 Series processors, AMD RDNA™ 3 onboard graphics, and a built-in Ryzen AI NPU. According to HP, these components work together to balance workloads and get the most out of cloud-based AI applications.³ Your company can prioritize security by investing in HP Care Packs and/or invest in HP Wolf Pro Security Edition PCs, which provide preconfigured enterprise-level PC protection. Organizations can also pair the HP Elite SFF 805 G9 Desktop PCs with specialized accessories, including monitors, speaker bars, and wireless keyboard and mouse combos. A few real-world use case scenarios for these systems include:

Healthcare: Caregivers can access electronic medical records with room to spare for other medical equipment.

Industrial and manufacturing: Organizations can replace full-sized computers to run operations.

Light office work: Hot desking and hoteling workforces have more space for documents, tools, and other items.

Retail: Clerks can set up shop in convenient places to deliver fast checkout experiences.

Security and surveillance: Systems consume less energy for 24/7 monitoring activity, intelligence collection, and crime prevention.

Maximizing day-to-day productivity

For an overarching view of day-to-day productivity, we evaluated the systems' general and content creation performance.

For general performance, we used the PassMark PerformanceTest 11 benchmark. **PassMark PerformanceTest 11** combines CPU, 2D and 3D graphics, storage, and memory test performance metrics into an overall PassMark rating.⁴

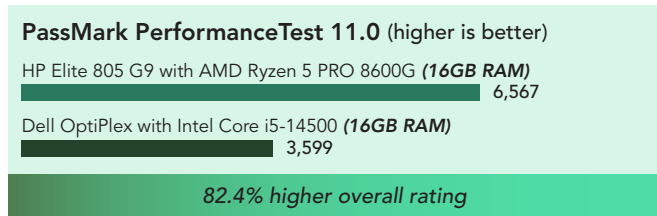


Figure 1: PassMark PerformanceTest results. Higher is better. Source: Principled Technologies.

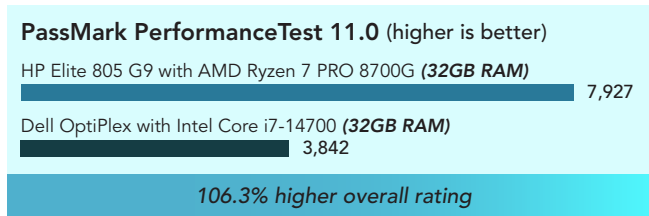


Figure 2: PassMark PerformanceTest results. Higher is better. Source: Principled Technologies.

For content creation performance, we used Procyon benchmarks. **Procyon Photo Editing Benchmark** uses Adobe® Creative Cloud® applications in a photo-editing workflow that includes batch processing and image retouching.⁵ **Procyon Video Editing Benchmark** uses Adobe Premiere® Pro in a video-editing workflow that includes importing video files, editing them, adding effects, and exporting them.⁶

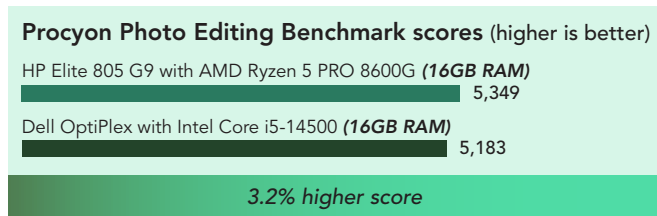


Figure 3: Procyon Photo Editing Benchmark results. Higher is better. Source: Principled Technologies.

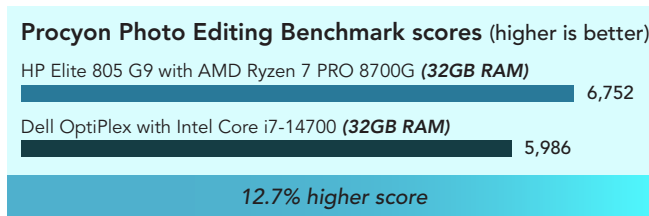


Figure 4: Procyon Photo Editing Benchmark results. Higher is better. Source: Principled Technologies.

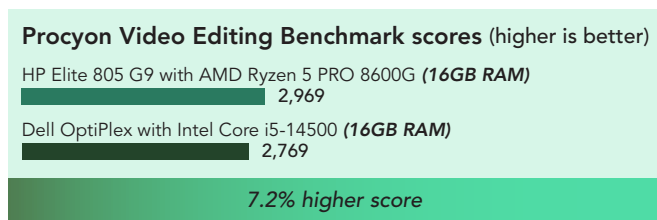


Figure 5: Procyon Video Editing Benchmark results. Higher is better. Source: Principled Technologies.

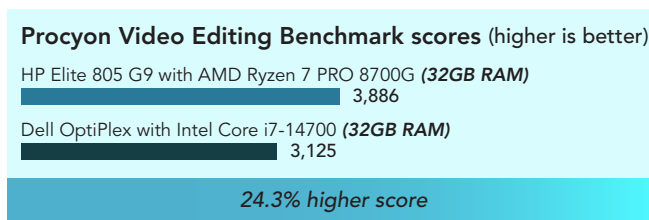


Figure 6: Procyon Video Editing Benchmark results. Higher is better. Source: Principled Technologies.

In these day-to-day productivity performance comparisons, the AMD Ryzen 8000G Series processor-powered HP Elite SFF 805 G9 Desktop PCs edged out their Intel Core processor-based Dell OptiPlex SFF Plus competitors.



Powering graphics-intensive workloads

While your workforce is probably not playing games on these systems, better gaming performance can translate to faster response times from graphics-intensive financial analysis programs, demanding scientific simulations, and product design and development software. **3DMark** Fire Strike and Time Spy workloads scan a system's hardware and estimates the frame rates you can expect when tackling CPU- and GPU-intensive tasks.⁷ In these graphics-heavy workload performance comparisons, the AMD Ryzen 8000G Series processor-powered HP Elite SFF 805 G9 Desktop PCs seriously outperformed the Intel Core processor-based Dell OptiPlex SFF Plus competitors.

3DMark Fire Strike scores (higher is better)

HP Elite 805 G9 with AMD Ryzen 5 PRO 8600G (16GB RAM)	4,965
Dell OptiPlex with Intel Core i5-14500 (16GB RAM)	2,700

83.8% higher overall score

Figure 7: 3DMark Fire Strike workload results. Higher is better. Source: Principled Technologies.

3DMark Fire Strike scores (higher is better)

HP Elite 805 G9 with AMD Ryzen 7 PRO 8700G (32GB RAM)	7,419
Dell OptiPlex with Intel Core i7-14700 (32GB RAM)	2,832

161.9% higher overall score

Figure 8: 3DMark Fire Strike workload results. Higher is better. Source: Principled Technologies.

3DMark Time Spy scores (higher is better)

HP Elite 805 G9 with AMD Ryzen 5 PRO 8600G (16GB RAM)	1,919
Dell OptiPlex with Intel Core i5-14500 (16GB RAM)	893

114.8% higher overall score

Figure 9: 3DMark Time Spy workload results. Higher is better. Source: Principled Technologies.

3DMark Time Spy scores (higher is better)

HP Elite 805 G9 with AMD Ryzen 7 PRO 8700G (32GB RAM)	3,216
Dell OptiPlex with Intel Core i7-14700 (32GB RAM)	933

244.6% higher overall score

Figure 10: 3DMark Time Spy workload results. Higher is better. Source: Principled Technologies.

Running AI and ML applications more efficiently

AI and machine learning (ML) workloads can be data-hungry resource hogs. Investing in more powerful systems with plenty of RAM can open the door to a world of possibilities for scientists, analysts, researchers, and engineers. With powerful systems that can better handle large language models (LLMs) and ML inference workloads at various levels of precision, these professionals can get answers faster and act on valuable insights sooner.

LM Studio uses LLMs to evaluate AI chat capabilities.⁸ In our testing, we used the Llama 3 LLM to capture token metrics. Content creation, translation, sentiment analysis, and question answering are just a few popular LLM applications. In LLMs, tokens represent words, subwords, or characters. The LLM “generates output by predicting the most likely token to follow a sequence of input tokens.”⁹ So, the more tokens you add to the pool, the richer the context for your answers. And the less time it takes to access the first token and process tokens per second, the faster you get more accurate responses.

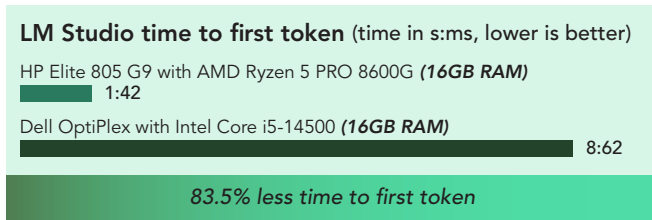


Figure 11: LM Studio (time to first token) results. Time in seconds (s:ms). Less time is better. Source: Principled Technologies.

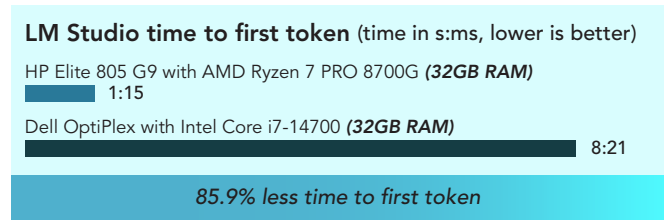


Figure 12: LM Studio (time to first token) results. Time in seconds (s:ms). Less time is better. Source: Principled Technologies.

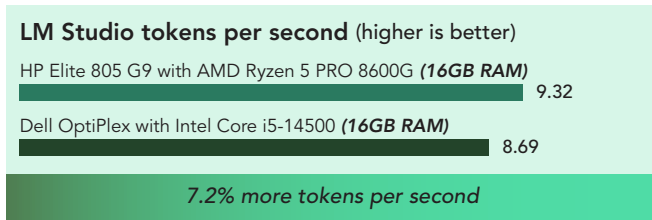


Figure 13: LM Studio (tokens per second) results. Higher is better. Source: Principled Technologies.

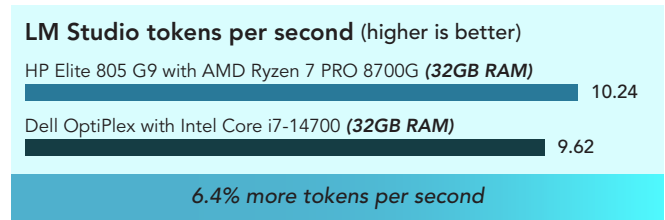


Figure 14: LM Studio (tokens per second) results. Higher is better. Source: Principled Technologies.

In the context of ML inference, an integer (int8) is a number without a decimal point, and floating-point numbers (float16 and float32) have a decimal place.¹⁰ In a nutshell, float32 results are more precise than float16 results, which are more precise than int8 results. In the security industry, lower levels of precision (int8) may be enough to identify whether the object that tripped a vision-based sensor is an animal or a human being. In the medical field, the highest levels of precision (float32) are prized for hyper-accurate image analysis and object classification.



Geekbench AI uses the predictions computed by a single-precision float32 model and a quantized score utilizing faster int8 precision to evaluate real-world AI performance.¹¹ The Single Precision score reports float32 precision and the Quantized score reports int8 precision.¹² In our testing, we used the Open Neural Network Exchange (ONNX) AI framework and DirectML AI backend for machine learning on Windows.

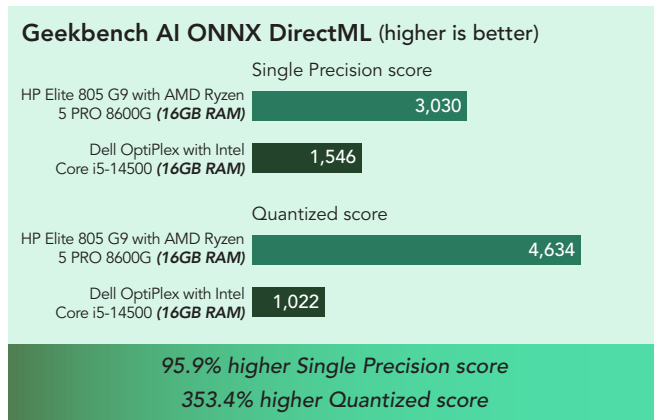


Figure 15: Geekbench AI ONNX DirectML Single Precision (float32) and Quantized (int8) results. Higher is better. Source: Principled Technologies.

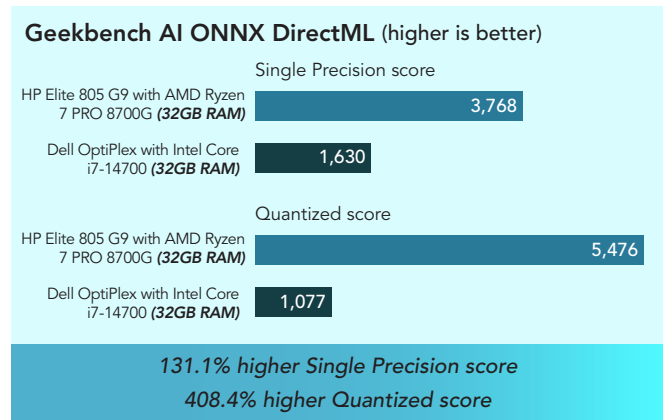


Figure 16: Geekbench AI ONNX DirectML Single Precision (float32) and Quantized (int8) results. Higher is better. Source: Principled Technologies.

In these AI and ML application performance comparisons, the AMD Ryzen 8000G Series processor-powered HP Elite SFF 805 G9 Desktop PCs performed better than their Intel Core processor-based Dell OptiPlex SFF Plus competitors.

About AMD Ryzen AI processors

According to AMD, “AMD Ryzen AI is the world’s first dedicated AI engine with x86 processors and powers hundreds of different AI functions so you can rethink productivity for your workflows.”¹³ With AMD Ryzen AI built directly into HP Elite SFF 805 G9 Desktop PCs, the AMD Ryzen CPU and Radeon GPU can focus on non-AI tasks. The AMD Ryzen AI NPU has the potential to help users generate concepts, create designs, and boost productivity.¹⁴

AMD says that AMD Ryzen 8000 Series desktop processors are “tuned to deliver the best performance available for multitasking productivity and premium collaboration experiences.”¹⁵

AMD Ryzen 5 PRO 8600G

This 6-core, 12-thread desktop processor is built on Zen 4 architecture. It includes AMD Ryzen AI capabilities with up to 16 trillions of operations per second (TOPS) of NPU performance. Clock speeds are between 4.3 GHz and 5.0 GHz.¹⁶

AMD Ryzen 7 PRO 8700G

This 8-core, 16-thread desktop processor is built on Zen 4 architecture. It includes AMD Ryzen AI capabilities with up to 16 TOPS of NPU performance. Clock speeds are between 4.2 GHz and 5.1 GHz.¹⁷



Procyon AI Computer Vision Benchmark uses a variety of inference engines to gauge machine learning application performance.¹⁸ In our testing, we used Windows ML inference API on the AMD-based systems and the Intel OpenVINO™ inference API on the Intel-based systems. The Windows ML API allowed the use of AMD hardware acceleration features, while the OpenVINO API is optimized for Intel CPU, GPU, and NPU inference.

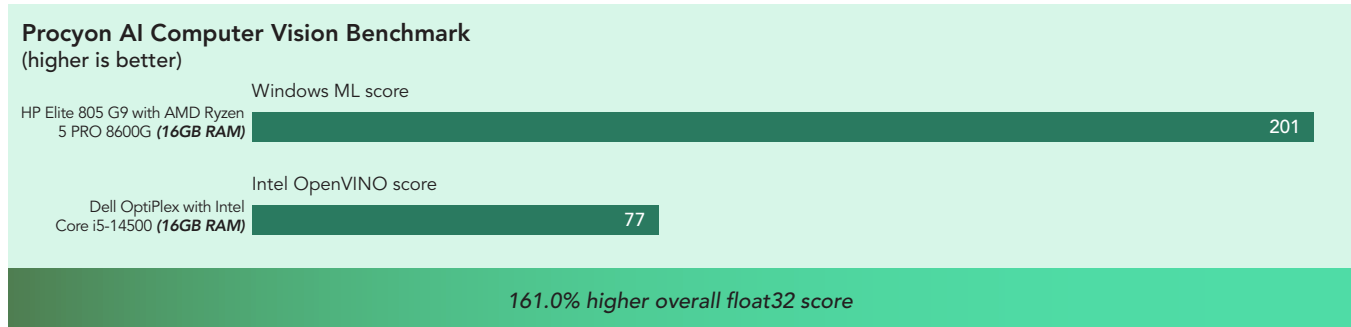


Figure 17: Procyon AI Computer Vision Benchmark float32 GPU scores. Higher Is Better. Source: Principled Technologies.

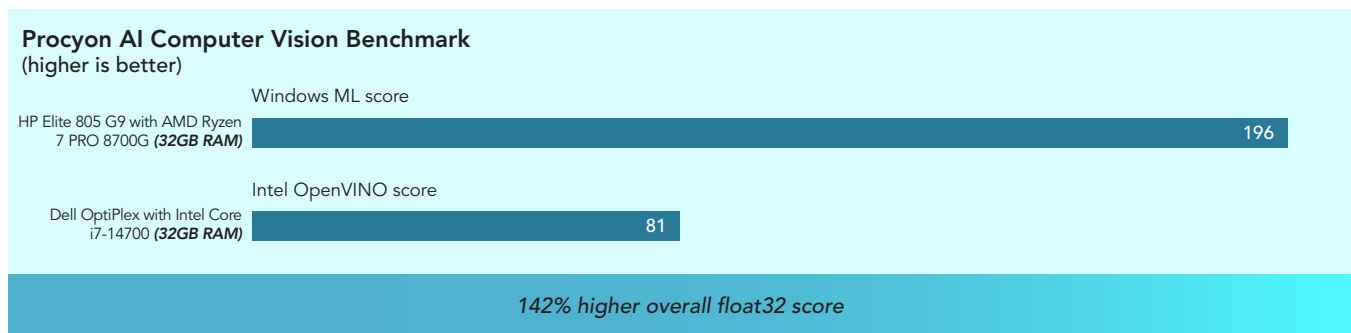


Figure 18: Procyon AI Computer Vision Benchmark float32 GPU scores. Higher Is Better. Source: Principled Technologies.

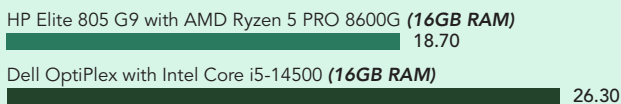


Use less energy with that performance bump

Decreasing the amount of energy your systems use during resource-intensive tasks can help your company save money and reduce your carbon footprint. Such tasks include modeling 3D figures, rendering an MRI scan, running a complex financial algorithm, and sharing material during a video call. For this power efficiency comparison, we recorded the watts each system consumed while sharing a large Microsoft PowerPoint file during a 30-minute Microsoft Teams video meeting with four participants. In August 2024, the average price of electricity per kW/h in the U.S. (city average) was 0.177 U.S. dollars, or just over 17 cents.¹⁹

For real-world context around our results, let's break down the results in Figure 19. In this comparison, the HP Elite SFF 805 G9 Desktop PC powered by the AMD Ryzen 5 PRO 8600G processor consumed 7.6 fewer watts than the Dell OptiPlex SFF Plus Desktop powered by an Intel Core i5-14500 processor. That's 35.2 fewer watts consumed per hour for a single system. Now multiply that by the number of systems you're running. Then, figure out how many resource-intensive tasks all of your users are completing daily, weekly, monthly, and yearly. Every win counts when you have sustainability goals to meet.

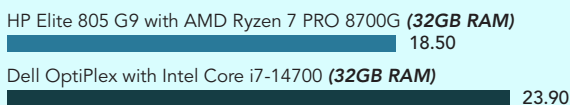
Power consumption during a video meeting presentation (Watts, lower is better)



28.8% less power consumption

Figure 19: Watts consumed during a 30-minute PPT presentation on a Microsoft Teams video call with four participants. Lower is better. Source: Principled Technologies.

Power consumption during a video meeting presentation (Watts, lower is better)



22.5% less power consumption

Figure 20: Watts consumed during a 30-minute PPT presentation on a Microsoft Teams video call with four participants. Lower is better. Source: Principled Technologies.



Conclusion

In our hands-on tests of four small form factor desktop PCs, we found that HP Elite SFF 805 G9 Desktop PCs powered by either an AMD Ryzen 5 PRO 8600G processor and 16GB RAM or an AMD Ryzen 7 PRO 8700G processor and 32GB RAM outperformed similarly configured Intel vPro with Intel Core processor-powered Dell OptiPlex SFF Plus Desktops. We also found that both versions of the AMD Ryzen PRO processor-powered HP Elite SFF 805 G9 Desktop PCs used less energy than their Intel Core processor-powered Dell OptiPlex SFF Plus Desktop counterparts during resource-intensive video call presentations. These findings suggest AMD Ryzen PRO 8000G Series processor-powered HP Elite SFF 805 G9 Desktop PCs can help you transform business data into actionable insights.

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