



READY TO POWER UP?

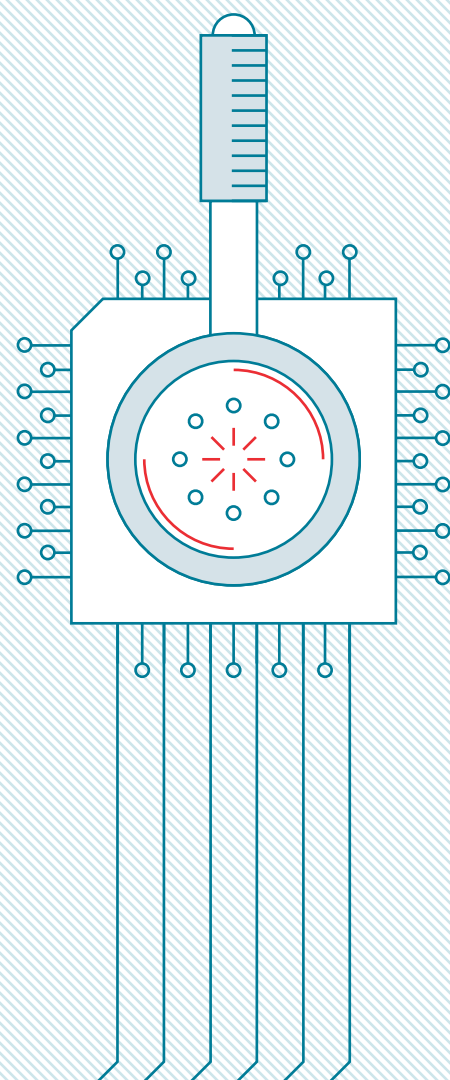
What to Look for in Business
Processors Like AMD Ryzen™ PRO

Introduction

Since the dawn of PCs, users have been clamoring for faster and more reliable performance. And with today's work environments and workloads, those demands are completely justified. Users are integrating work and personal technologies, they're conferencing and collaborating with people across the globe, and they're running intense workloads with data and graphics that put processors through their paces.

Workloads like these also raise the stakes for PC security. Mobile use and collaboration can make endpoints particularly vulnerable to attack, putting data and other resources at risk. More than ever, your organization needs secure, reliable, high-performance PC computing.

That's where processors come in. While every PC in the world is powered by a processor, not all processors are created equal. When evaluating new end-user devices, it's important to know what you're getting. This white paper explores the features you should look for in a processor—and what makes AMD processors unique.



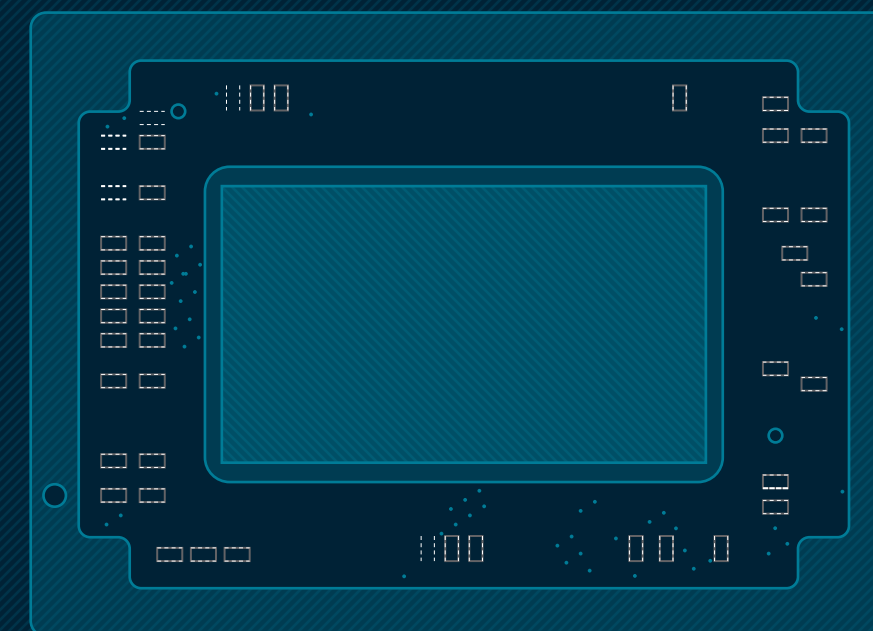
What's in a Processor?

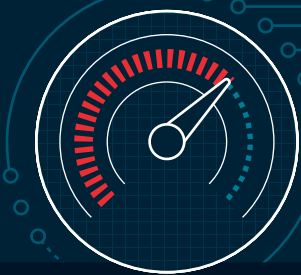
Your choice of processor determines what experience you and your end users ultimately get out of an end-user device, no matter what kind of device it is or what features it may offer. End users want the latest performance so their PCs can get out of their way during the creative process. They want to be able to use the latest collaboration tools, manage many tasks at the same time, and do it all on the go with decent battery life.

IT managers want to keep users happy with the performance of their systems while also helping protect the organization against security threats. They want to be able to manage systems and know that they have a commercial-grade quality product.

What distinguishes one processor from another?

It's the ability to satisfy all these sometimes-competing issues. And when you evaluate these factors, AMD Ryzen™ PRO mobile and desktop processors with Radeon™ Vega Graphics stand out.





COMPUTE

Performance is probably the first factor you think of when evaluating a processor. Skimp on compute and your users will face unresponsive applications and have difficulty multitasking. They'll have to close background applications, essentially forcing them to choose where to spend their limited processing power.

AMD Ryzen PRO processors feature 12nm technology that delivers high efficiency and superb performance. Users have the power to collaborate without hiccups, multitask seamlessly, and get more done. With multiple cores and multiple threads, these processors are specifically designed to address future demands so you don't have to worry about early obsolescence.

Internal AMD Cinebench nT benchmark testing shows that Ryzen PRO processors deliver up to 187% faster multi-thread performance over an AMD processor from just three years ago,¹ and up to 10% faster CPU multi-thread performance over the current generation of competitor processors.²



GRAPHICS

You no longer have to be in a graphics-driven industry to require high graphics performance. HD video, complex presentations, 3D modeling, rich collaboration and conferencing, multi-display demands—they all add up to higher requirements for graphics performance.

AMD Ryzen PRO processors with Radeon Vega Graphics accelerate these and other graphics workloads, allowing you to visualize in real-time and speed up your business and creative workflows. These processors support HDMI™ 2.0b and DisplayPort™ 1.4 HBR3 outputs that can boost employee productivity by supporting up to four 4K UHD displays. Radeon FreeSync™ Technology provides smoother playback for video content.

In 3DMARK® 11P benchmark tests, AMD Ryzen PRO processors with Radeon Vega Graphics deliver up to 111% higher graphics performance over the current generation of competitor processors.² They deliver up to 35% faster photo editing with Adobe Photoshop CC Filters, up to 64% faster 3D modeling with the SPECviewperf® 13 benchmark 3dsmax-06 viewset, and up to 258% faster 3D volume visualization with SPECviewperf medical-02 viewset.³



SECURITY

When it comes to end-user devices, the challenge is to provide security without impacting productivity. Security is critical given that end-user devices, due to their potential mobility, are exposed to some of the highest security risks, especially when outside the control of their IT department. In addition, users are known for circumventing security measures that inhibit their workflows. As a result, security has to be automated, enforced programmatically, and ideally built into the hardware.

Ryzen PRO processors were designed with security in mind. Ryzen PRO processors help protect against bootkit attacks, OS and app attacks, and memory / cold boot attacks. Every Ryzen PRO processor contains a powerful, built-in security co-processor that runs AMD GuardMI, creating a robust hardware-based root of trust. From power-on to power-off, this integrated, dedicated security co-processor helps protect PCs without disrupting users.

Whether you are a large corporation or small business, protecting customer and business data is important. With modern notebooks and desktop PCs, many of which are never fully powered off, there is a threat of data being stolen from a cold boot attack via a lost notebook or unsecured desktop. In fact, a notebook is stolen every 53 seconds, and 56% of lost and stolen laptops result in a data breach.⁴ Many security mechanisms, even drive encryption, can be defeated through a cold boot attack. Today a mitigation is to completely shut a PC off after every use, impacting productivity. This puts the burden on the end user to remember to shut down their PC instead of just leaving it on or putting it in standby.

Ryzen PRO provides AMD Memory Guard, a transparent and protective memory encryption that helps protect system memory, is OS- and application-independent, and requires no software or software modifications. It provides a cryptographically strong AES encryption of system memory, helping to greatly mitigate cold boot attacks and allowing the PC to be used as intended. As a result, users do not need to shut their PC off in order to protect sensitive data. AMD Ryzen PRO and Athlon™ PRO are the only processor family that offers AMD's full set of security features, including memory encryption, on every model.^{5,6}



INTEGRATION AND MANAGEABILITY

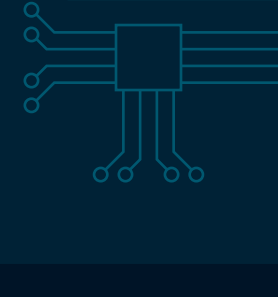
Management of end-user devices can place a huge burden on IT teams, especially when you're supporting users who work from home or who travel, or when you have workers scattered in branch offices. These types of organizations need remote management.

AMD Ryzen PRO and Athlon PRO are the only processor family that offers a full set of manageability features on every model. Industry-leading DASH manageability for remote administration comes standard in all Ryzen PRO processors. Based on open standards, DASH allows quick and easy remote access and diagnostics—both in-band and out-of-band—to streamline management of your fleet of PCs. As a CPU-agnostic technology, DASH also helps ensure that IT pros don't get locked into proprietary solutions that can add cost without real benefit.

As for implementation, Ryzen PRO processors easily integrate into your IT environment. For instance, when deploying Microsoft Windows, you can use the same imaging and deployment processes as Intel®-based systems and use your existing tools, so there are no new processes to learn, and you won't be locked into proprietary software.⁷

QUALITY AND RELIABILITY

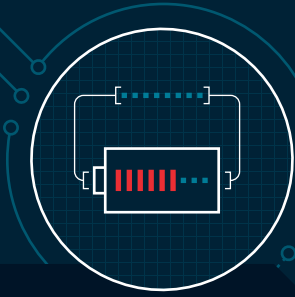
Quality control plays a huge part in determining the reliability of an end product. Manufacturing variabilities and inconsistent sourcing can result in defective parts, gutting system reliability. AMD Ryzen PRO processors offer commercial-grade quality, with products sourced from wafers with the highest yields, helping ensure exceptional dependability. In addition, 18 months of planned platform stability helps bring peace of mind.



EFFICIENCY AND BATTERY LIFE

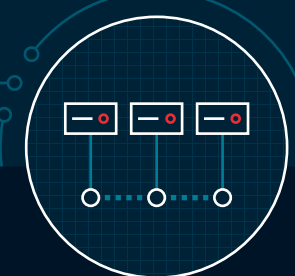
Efficiency of end-user devices is important for reducing desktop power costs and for extending the battery life of mobile devices. The ideal processor can save you money by using less energy while providing cutting-edge compute and graphics performance for your users.

Ryzen PRO 12nm processors offer superb efficiency, generating less heat (and requiring less cooling) than a similar AMD processor from three years ago.⁸ Efficiency also helps mobile users who need to stay productive all day. In fact, Ryzen 7 PRO 3700U mobile processors provide up to 16.4 hours of general productivity battery life.⁹ Testing in AMD labs shows up to 50% improvement in battery life over the previous generation of Ryzen processors—a testament to AMD's commitment to continuous innovation.¹⁰



AVAILABILITY

It's difficult to ensure continuity in your PC fleet when you standardize on processors that have availability issues. AMD Ryzen PRO offers 24 months of planned availability, helping to ensure stable enterprise operations. Long-term processor availability facilitates multi-year PC fleet renewal planning, helping you make smarter investments.



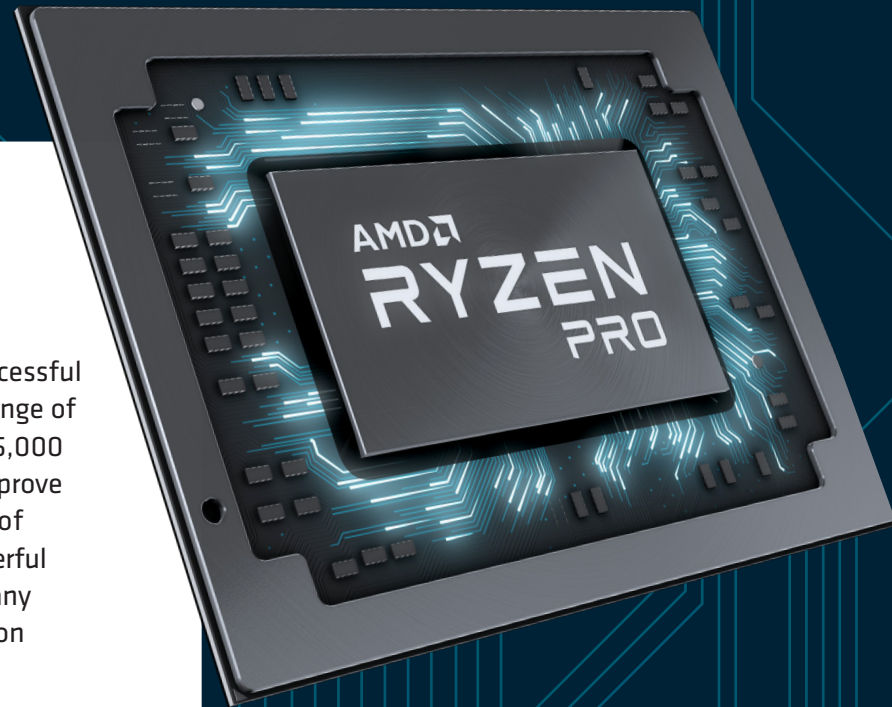
RYZEN PRO PROCESSORS IN ACTION

One of the world's best-known and most successful investment banks recently took on the challenge of refreshing end-user devices for more than 15,000 associates around the world. The goal? To improve user experiences by powering a wide range of desktop and corporate functionality with powerful compute and graphics processing. The company chose AMD Ryzen PRO processors with Radeon Vega Graphics for this mission.

The company relies on powerful computing to help brokers be productive as they place trades, monitor markets, scan news feeds, and review financial documents in a dynamic and fast-paced multi-display environment. To that end, the Radeon Vega GPU cores can support four 4K displays at 60 Hz with Radeon FreeSync HDR technology. "The competition can't even get those monitors to turn on," says one company executive. "Most products would need a discrete GPU and a lot of horsepower to drive those monitors alone—not to mention web browsing, office productivity suites, video conferencing applications, and more."

Graphics performance is particularly important for investment professionals consuming large amounts of data at any given moment, and the Ryzen PRO processor does not disappoint. "You get a super smooth stutter-free experience, and that is hard to do when you're driving that many pixels," says the executive.

"That graphics feature set is unmatched."



Why AMD?

Since our founding 50 years ago, AMD has driven innovation in high-performance computing, graphics, and visualization technologies—the building blocks for gaming, immersive platforms, and the data center. Hundreds of millions of consumers, Fortune 500 businesses, and cutting-edge scientific research facilities rely on AMD technology daily to improve how they live, work, and play. AMD employees around the world are focused on building great products that push the boundaries of what is possible.

Ryzen PRO processors are an ideal example of the principles of AMD in action. Ryzen PRO processors empower your users to be:

PRODUCTIVE

Ryzen PRO processors are powerful enough to run multiple applications simultaneously and offer the world's best graphics,¹¹ but efficient enough to provide all-day productivity on a single charge.⁹

PROTECTIVE

Ryzen PRO processors offer state-of-the-art security features on every model, including memory encryption as well as helping protect systems against bootkits, OS and app attacks, and cold boot / memory attacks.

PROFESSIONAL

Ryzen PRO processors offer world-class quality and reliability, a full manageability suite built in, and two years of planned availability.

Innovative system architectures from AMD are poised to become the future of computing, unlocking the full compute capability of business-class PCs by allowing the CPU, GPU, and security features to work intelligently together. Equipped with this technology, AMD offers seamless performance and exceptional power efficiency, empowering your people to have real impact.

Learn more

Ask your reseller for AMD or visit [AMD.com](https://www.amd.com) to learn more.



FOOTNOTES

- ¹ Testing conducted by AMD Performance Labs as of January 10, 2019. Cinebench nT used to measure CPU Multi Thread Performance. Testing conducted on an A12-9800B, Ryzen 7 PRO 3700U, Ryzen 7 PRO 2700U. Results may vary. PP-7
- ² Testing conducted by AMD Performance Labs as of April 3, 2019. Cinebench nT used to measure CPU Multi Thread performance. Testing conducted on an i7-8650U vs Ryzen 7 PRO 3700U. PC manufacturers may vary configurations yielding different results. Results may vary. PP-13
- ³ Testing conducted by AMD Performance Labs as of January 10, 2019. Testing conducted on an i7-8650U vs Ryzen 7 PRO 3700U. "Photo Editing" defined as a scripted series of photo filters in Photoshop. SPECviewperf® 13 3dsmax-06 viewset used to measure 3D modeling performance. Performance presented in i7-8650U (Dell Latitude 7490) (100%) vs Ryzen 7 PRO 3700U scored an average of 24.265 while the i7-8650U scored an average of 14.7525 for a comparison of 24.265/14.7525=1.64 | SPECviewperf 13 medical-02 viewset used to measure medical 3D volume visualization performance. PCMark® 10 DCC Subtest used to measure Content Creation Performance. System Configuration: AMD Ryzen™ 7 PRO 3700U, 2x4GB DDR4, Radeon™ Vega 10 Graphics (driver 25.20.14102.16), Samsung 850 Pro SSD, Windows® 10 Pro x64 | Intel i7-8650U, Dell Latitude 7490, 2x4GB DDR4, Intel UHD 620 Graphics (driver 22.20.16.4799), Samsung 850 Pro SSD, Windows® 10 Pro x64 PC manufacturers may vary configurations yielding different results. All scores in are an average of 3 runs with the same settings. SPEC® and SPECviewperf® are registered trademarks of Standard Performance Evaluation Corporation. Additional information about the SPEC® benchmarks can be found at www.spec.org/gwpg. PCMark is a registered trademark of Futuremark Corporation. Results may vary. PP-10
- ⁴ Sharpe, Nathan, "7 Shocking Statistics That Prove Just How Important Laptop Security Is," *Security Boulevard*, September 10, 2018. <https://securityboulevard.com/2018/09/7-shocking-statistics-that-prove-just-how-important-laptop-security-is/>
- ⁵ For notebooks and desktops for general purpose business use. PP-4
- ⁶ For general business laptops and desktops, the AMD Transparent Secure Memory Encryption feature is included in AMD PRO processors. PP-3
- ⁷ "Deploy a Microsoft Windows 10 image to AMD processor-based systems without altering existing processes," *Principled Technologies*, May 2018.

- ⁸ Testing conducted by AMD Performance Labs as of Sept. 20, 2018 and Feb 26, 2016 Tested with 3DMark 11. Temperatures in degrees Celsius and 100% Battery with adapter plugged in (AC Mode) at 21C ambient for minimum 2hour The measured temperatures of Ryzen™ 5 PRO 2500U relative to the i5-8350U are: Top Left : +1.5Key "F9" : -0.6Left Palm : -0.2Right Palm : 0.0Bottom cover left : -0.3Ryzen™ 5 PRO 2500U produced measured temperatures of:Top Left : 36.3Key "F9" : 32.6Left Palm ; 27.4Right Palm : 26.5Bottom cover left : 33.7Bottom cover right ; 33.9Intel i5-8350U produced measured temperatures of:Top Left : 34.8Key "F9" : 33.2Left Palm : 27.2Right Palm : 26.5Bottom cover left : 32.8Bottom cover right : 34.2System Configurations:Ryzen™ 5 PRO 2500U – HP Elitebook 745 @ 15W, AMD Ryzen™ 5 PRO 2500U processor with Radeon™ Vega 10 graphics, 8GB DDR4-2400 RAM, Samsung 850 EVO 512GB SSD, Windows 10 PRO, icrosoft Windows 10 Professional (x64) Build 17134 graphics driver 23.20.841.1792, June 26, 2018 Performance may vary based on use of latest drivers. RPM-56
- ⁹ Lenovo laptop configured with Ryzen 7 PRO Processors. Battery life estimate is provided for informational purposes only, and is based on OEM testing not independently verified by AMD. <https://www.lenovo.com/ca/en/laptops/thinkpad/thinkpad-t-series/T495s/p/22TP2TT495S>
- ¹⁰ Testing by AMD performance labs as of 12/4/2018. "Battery life" defined as hours of continuous usage before the system automatically shuts down due to depleted battery. Video playback tested according to Microsoft WER methodology, while "general usage" is tested via MobileMark 14. Results presented in hours, in order of: 1st Gen AMD Ryzen™ 7 2700U Mobile Processor (100%) vs. 2nd Gen AMD Ryzen™ 7 3700U Mobile Processor. General Usage: Ryzen™ 7 2700U: 8.1 hours vs. Ryzen™ 7 3700U: 12.3 hours (51% longer) Video Playback: Ryzen™ 7 2700U: 6.9 hours vs. Ryzen™ 7 3700U: 10 hours (40% longer) Ryzen™ 7 2700U Test System: Lenovo IdeaPad 530s, Ryzen™ 7 2700U, 2x4GB DDR4-2400, Radeon™ Vega10 Graphics (driver 23.20.768.0), 1920x1080 AUO 403D 13.9" panel, 512GB Toshiba KBG30ZMT512G SSD, 45Whr battery, 150 nits brightness, Windows® 10 x64 RS4. Ryzen™ 7 3700U Test System: AMD Reference Motherboard, AMD Ryzen™ 7 3700U, 2x4GB DDR4-2400, Radeon™ Vega10 Graphics (driver 23.20.768.0), AUO B140HAN05.4 14" panel, 256GB WD Black WD256G1XOC SSD, 50Whr battery, 150 nits brightness, Windows® 10 x64 RS5. Results may vary with drivers and configuration. RVM-164
- ¹¹ Testing conducted by AMD Performance Labs as of February 13, 2019. 3DMark® 11 Performance used to measure graphics performance. Testing performed on Intel Core i7 8560U vs. AMD Ryzen 7 PRO 2700U; Intel Core i7 7600U vs. AMD Ryzen 7 PRO 2700U; Intel Core i5 8350U vs. AMD Ryzen 5 PRO 2500U; Intel Core i5 8250U vs. AMD Ryzen 5 PRO 2500U; Intel Core i5 7300U vs. AMD Ryzen 5 PRO 2500U; Intel Core i3 8121U vs. AMD Ryzen 3 PRO 2300U; Intel Core i5 8500 vPRO vs. AMD Ryzen 5 PRO 2400G; Intel Core i5 8400 vs. AMD Ryzen 5 PRO 2400G; Intel Core i5 8500T vPro vs. AMD Ryzen 5 PRO 2400GE; Intel Core i3 8300 vs. AMD Ryzen 3 PRO 2200G; Intel Pentium G4560 vs. AMD Athlon PRO 200GE; Intel Pentium G5600 vs. AMD Athlon PRO 200GE; Intel Pentium G5500 vs. Athlon PRO 200GE. 3DMark is a registered trademark of Futuremark Corporation. Results may vary. PP-2

