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AMD President and CEO Dr. Lisa Su Reveals Coming High-Performance Computing Inflection Point in CES 2019 Keynote

— *Powerful new generations of 7nm AMD computing and graphics products to enable creators, researchers and inventors to solve the world's toughest and most interesting challenges* —

LAS VEGAS, Jan. 09, 2019 (GLOBE NEWSWIRE) -- [AMD](#) (NASDAQ: AMD) today highlighted historic leaps in computing, gaming and visualization technologies expected in 2019 based on a combination of leading-edge 7nm technology and the most advanced computing and graphics designs the company has ever created. During her CES 2019 keynote presentation, AMD President and CEO Dr. Lisa Su announced the world's first 7nm gaming graphics processing unit (GPU), AMD Radeon™ VII; detailed the world's fastest processor for ultrathin laptops¹, 2nd Gen AMD Ryzen™ Mobile processors; and provided the first public demonstration of the upcoming 7nm 3rd Gen AMD Ryzen™ desktop processor. Su was joined by a number of industry luminaries including Microsoft Executive Vice President of Gaming Phil Spencer, Massive Entertainment Managing Director David Polfeldt, and FNATIC Co-Founder and Chairman Sam Mathews.

Su's keynote focused on solving the world's toughest and most interesting challenges through high-performance computing and graphics innovation. From bringing a storyteller's vision to life through digital characters, to helping communities come together through a shared love of gaming, to solving some of our toughest challenges in the realms of education, healthcare, climate change and energy solutions, AMD sees incredible opportunities to apply more powerful computing technologies to solve some of society's toughest problems.

"This is an incredible time to be in technology as the industry pushes the envelope on high-performance computing to solve the biggest challenges we face together," said Su. "At AMD, we made big bets several years ago to accelerate the pace of innovation for high-performance computing, and 2019 will be an inflection point for the industry as we bring these new products to market. From our 7nm Radeon™ graphics chips to our next-generation 7nm AMD Ryzen™ and AMD EYPC™ processors, it's going to be an exciting year for AMD and the industry."

AMD Gaming Graphics Updates

Reinforcing its commitment to next-generation gaming leadership, AMD [announced](#) the world's first 7nm gaming GPU, AMD Radeon™ VII, designed to deliver exceptional performance and amazing experiences for the latest AAA, esports and Virtual Reality (VR) titles, demanding 3D rendering and video editing applications, and next-generation compute workloads. The AMD Radeon™ VII graphics card provides 2x the memory² and 2.1x the

memory bandwidth³, up to 29 percent higher gaming performance on average⁴ and up to 36 percent higher performance⁵ on average in content creation applications compared to the AMD Radeon™ RX Vega 64 graphics card, enabling maximum settings for extreme framerates at the highest resolutions. It also provides seamless, high-refresh HDR⁶ gaming at 1080p, ultrawide 1440p and 4K, and powers the next-generation photo and visual creation applications on razor sharp, vibrant 8K monitors.

AMD Radeon™ VII graphics card is expected to be available beginning February 7, 2019.

AMD High-Performance Desktop Updates

For the several thousand keynote attendees and the record-size CES keynote livestream audience, AMD performed the first public demonstrations of the upcoming 3rd Gen AMD Ryzen™ desktop processor. The 3rd Gen AMD Ryzen™ processor is based on the new AMD “Zen 2” x86 core built using world-leading 7nm process technology. It is expected to deliver new levels of performance⁷ and will be the world’s first PC platform to support PCIe 4.0 connectivity⁸. The new AMD Ryzen processors will offer better gaming, creating and streaming experiences than ever before with a faster and quieter PC.

The live demonstration showed a 3rd Gen AMD Ryzen™ desktop pre-production processor vs. an Intel Core™ i9-9900K processor in a real-time rendering demonstration using Maxon Cinebench R15. The AMD Ryzen processor offered comparable performance at approximately 30% lower power⁹. Additionally, Dr. Su showed the power of AMD technology working together with a live gaming demonstration of a 3rd Gen AMD Ryzen™ desktop processor in an AMD socket AM4 platform paired with an AMD Radeon™ VII graphics processor.

The 3rd Gen Ryzen™ desktop processor is planned for introduction in mid-2019.

AMD Server Updates

The AMD EPYC™ datacenter processor had a tremendous first year, winning in the biggest cloud environments, and amassing more than 50 EPYC™-based platforms shipping from leading server providers.

Su showed the world’s first 7nm datacenter CPU, codenamed “Rome,”¹⁰ based on the “Zen 2” x86 core. Su revealed the real-world power of the next generation of AMD EPYC™ by demonstrating a step-function increase in datacenter processor performance using the scientific application NAMD, which simulates large bio-molecular systems. The demonstration compared a single pre-production EPYC™ “Rome” processor to two high-end Intel Xeon Platinum 8180 processors, and the single next-generation EPYC™ processor delivered approximately 15% higher performance¹¹. By using EPYC™-based systems, AMD is helping scientists to advance their research and get closer to finding the next big solutions.

The AMD EPYC™ “Rome” processor is on track to start shipping in mid-2019.

AMD Mobile Computing Updates

AMD [launched](#) the 2nd Gen AMD Ryzen™ Mobile processor with Radeon™ Vega Graphics, delivering the world’s fastest processor for ultrathin laptops. With up to 12 hours of general productivity and 10 hours of video playback battery life¹², 4K HDR video capability and

Microsoft Modern PC features, the 2nd Gen AMD Ryzen™ Mobile processors deliver the ultimate entertainment experience for the modern laptop buyer.

A record number of AMD Ryzen-based notebooks powered by the 2nd Gen AMD Ryzen™ Mobile processor with Radeon™ Vega Graphics are expected to be available in 2019 from Acer, Asus, Dell, HP, Huawei, Lenovo and Samsung.

Supporting Resources

- Visit the [CES webpage](#) for a full replay of the keynote, videos and product materials
- Become a fan of AMD on [Facebook](#)
- Follow AMD on [Twitter](#)

About AMD

For more than 45 years AMD has driven innovation in high-performance computing, graphics and visualization technologies — the building blocks for gaming, immersive platforms and the datacenter. Hundreds of millions of consumers, leading Fortune 500 businesses and cutting-edge scientific research facilities around the world 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. For more information about how AMD is enabling today and inspiring tomorrow, visit the AMD (NASDAQ: AMD) [website](#), [blog](#), [Facebook](#) and [Twitter](#) pages.

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that provide value to its customers while supporting and coinciding with significant industry transitions; if AMD cannot generate sufficient revenue and operating cash flow or obtain external financing, it may face a cash shortfall and be unable to make all of its planned investments in research and development or other strategic investments; the loss of a significant customer may have a material adverse effect on AMD; AMD's receipt of revenue from its semi-custom SoC products is dependent upon its technology being designed into third-party products and the success of those products; AMD products may be subject to security vulnerabilities that could have a material adverse effect on AMD; data breaches and cyber-attacks could compromise AMD's intellectual property or other sensitive information, be costly to remediate and cause significant damage to its business and reputation; AMD's operating results are subject to quarterly and seasonal sales patterns; global economic uncertainty may adversely impact AMD's business and operating results; AMD may not be able to generate sufficient cash to service its debt obligations or meet its working capital requirements; AMD has a large amount of indebtedness which could adversely affect its financial position and prevent it from implementing its strategy or fulfilling its contractual obligations; the agreements governing AMD's notes and the Secured Revolving Line of Credit impose restrictions on AMD that may adversely affect its ability to operate its business; the markets in which AMD's products are sold are highly competitive; AMD's issuance to West Coast Hitech L.P. (WCH) of warrants to purchase 75 million shares of its common stock, if and when exercised, will dilute the ownership interests of its existing stockholders, and the conversion of the 2.125% Convertible Senior Notes due 2026 may dilute the ownership interest of its existing stockholders, or may otherwise depress the price of its common stock; uncertainties involving the ordering and shipment of AMD's products could materially adversely affect it; the demand for AMD's products depends in part on the market conditions in the industries into which they are sold. Fluctuations in demand for AMD's products or a market decline in any of these industries could have a material adverse effect on its results of operations; AMD's ability to design and introduce new products in a timely manner is dependent upon third-party intellectual property; AMD depends on third-party companies for the design, manufacture and supply of motherboards, software and other computer platform components to support its business; if AMD loses Microsoft Corporation's support for its products or other software vendors do not design and develop software to run on AMD's products, its ability to sell its products could be materially adversely affected; and AMD's reliance on third-party distributors and AIB partners subjects it to certain risks. Investors are urged to review in detail the risks and uncertainties in AMD's Securities and Exchange Commission filings, including but not limited to AMD's Quarterly Report on Form 10-Q for the quarter ended September 29, 2018.

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¹ "Processor for ultrathin notebooks" defined as 15W typical TDP. "Class" for "best-in-class" defined as an ultrathin notebook <20mm Z-height. Testing conducted by AMD performance labs as of 12/02/2018.

Cinebench R15 nT ("CPU"):

Core i5-8250U vs. Ryzen™ 5 3500U: 524 vs. 651 (24%/1.24X faster for AMD);

Core i7-8565U vs. Ryzen™ 7 3700U: 619 vs. 688 (11%/1.11X faster for AMD);

3DMark® Time Spy ("GPU"):

Core i5-8250U vs. Ryzen™ 5 3500U: 399 vs. 907 (127%/2.27X faster for AMD);

Core i7-8565U vs. Ryzen™ 7 3700U: 444 vs. 967 (118%/2.18X faster for AMD).

50:50 Average of GPU and CPU:

Core i5-8250U vs. Ryzen™ 5 3500U: $(0.5 \times 1.24 + 0.5 \times 2.27) = 1.75X$ faster for AMD;
Core i7-8565U vs. Ryzen™ 7 3700U: $(0.5 \times 1.11 + 0.5 \times 2.18) = 1.645X$ faster for AMD.
Core i7-8565U Test System: Dell Inspiron 7586, 2x4GB DDR4-2400, Samsung 850 EVO SSD, Intel Graphics HD 620 (driver 24.20.100.6287), Windows® 10 Pro x64 (build 1803).
Core i5-8250U Test System: HP Spectre 13t, 2x4GB LPDDR4-2133, Samsung 850 EVO SSD, Intel Graphics HD 620 (driver 24.20.100.6287), Windows® 10 Pro x64 (build 1803).
AMD Ryzen™ Test System: AMD Reference Motherboard, 2x4GB DDR4-2400, Radeon™ Vega10 Graphics (driver 18.41-181105a), Windows® 10 Pro x64 (build 1803). Results may vary with configuration and drivers. RVM-155

² As of Dec 18, 2018. Radeon VII features 16GB of memory. Radeon RX Vega 64 features 8GB of memory. RX-266

³ As of Dec 18, 2018. Radeon VII features 1024 GB/s of memory bandwidth. Radeon RX Vega 64 features 484 GB/s of memory bandwidth. RX-267

⁴ Testing done by AMD performance labs 1/3/19 on Intel i7 7700K, 16GB DDR4 3000MHz, Radeon VII, Radeon RX Vega 64, AMD Driver 18.50 and Windows 10. Using Assassin's Creed Odyssey, Battlefield 1 DX12, Battlefield 5 DX12, Call of Duty: Black Ops 4, Destiny 2, Deus x: Mankind Divided DX12, Doom (2016), F1 2018 DX12, Fallout 76, Far Cry 5, Forza Horizon 4 DX12, Grand Theft Auto V, Hitman 2, Just Cause 4, Middle-Earth: Shadow Of War, Monster Hunter World, Rise of the Tomb Raider DX12, Shadow of the Tomb Raider DX12, Sid Meier's Civilization VI DX12, Star Control: Origins, Strange Brigade Vulkan, The Witcher 3, Tom Clancy's Ghost Recon Wildlands, Total War: Warhammer 2, Wolfenstein II: The New Colossus at 4K Max Settings: Radeon VII scored: 36 fps, 80.5 fps, 62.2 fps, 82.3 fps, 65.1 fps, 53.4 fps, 89.5 fps, 78 fps, 76.6 fps, 62 fps, 72.8 fps, 76.2 fps, 53.3 ps, 50.8 fps, 54.3 fps, 35.4 fps, 58.3 fps, 47.5 fps, 97.1 fps, 88.9 fps, 86.7 fps, 55.4 fps, 36.3 fps, 34.6 fps, 93.4 fps respectively. Radeon RX Vega 64 scored: 28 fps, 59.2 fps, 46.7 fps, 68.0 fps, 50.9 fps, 40.2 fps, 67.2 fps, 61 fps, 45.5 fps, 49 fps, 62.8 fps, 60.1 fps, 49.6 ps, 42.6 fps, 41.6 fps, 29.4 fps, 46.0 fps, 36.3 fps, 78.1 fps, 69.2 fps, 60.9 fps, 41.4 fps, 29.2 fps, 28.3 fps, 74.2 fps respectively. Across 25 titles, Radeon VII averaged 29% faster gaming performance vs Radeon Vega 64. PC manufacturers may vary configurations yielding different results. All scores are an average of 3 runs with the same settings. Performance may vary based on use of latest drivers. RX-282

⁵ Testing done by AMD performance labs 1/3/19 on AMD Ryzen 2700X, 16GB DDR4 3000MHz, Radeon VII, Radeon RX Vega 64, AMD Driver 18.50 and Windows 10. Across 4 content creation workloads/benchmarks: Davinci Resolve 15, Adobe Premiere, Luxmark and Blender. Radeon VII completed in /scored 101s, 330s, 50202 and 92s respectively. Radeon RX Vega 64 completed in/scored 138s, 462s, 31013 and 126s respectively. Resulting in Radeon VII vs Radeon RX 64 performance uplift of: 1.27x, 1.29x, 1.62x and 1.27x respectively. Radeon VII averaged 36% faster content creation performance vs Radeon Vega 64. PC manufacturers may vary configurations yielding different results. All scores are an average of 3 runs with the same settings. Performance may vary based on use of latest drivers. RX-283

⁶ HDR content requires that the system be configured with a fully HDR-ready content chain, including: graphics card, monitor/TV, graphics driver and application. Video content must be graded in HDR and viewed with an HDR-ready player. Windowed mode content requires operating system support. GD-96

⁷ Based on AMD internal assessment of pre-production 3rd generation Ryzen desktop processors against currently shipping AMD 2nd generation Ryzen desktop processors. RZ3-4

⁸ Specifications of 3rd generation Ryzen processors as of January 2, 2019.

As of January 7, 2019, the AMD's latest 2nd Generation Ryzen processors and Intel's latest 9th Generation Intel Core processors use the PCIe Gen3 interface (<https://ark.intel.com/products/186605/Intel-Core-i9-9900K-Processor-16M-Cache-up-to-5-00-GHz>). RZ3-2

⁹ Testing performed AMD CES 2019 Keynote. In Cinebench R15 nT, the 3rd Gen AMD Ryzen Desktop engineering sample processor achieved a score of 2057, better than the Intel Core i9-9900K score of 2040. During testing, system wall power was measured at 134W for the AMD system and 191W for the Intel system; for a difference of $(191-134)/191=.298$ or 30% lower power consumption.

System configurations: AMD engineering sample silicon, Noctua NH-D15S thermal solution, AMD reference motherboard, 16GB (2x8) DDR4-2666 MHz memory, 512GB Samsung 850 PRO SSD, AMD Radeon RX Vega 64 GPU, graphics driver 18.30.19.01 (Adrenalin 18.9.3), Microsoft Windows 10 Pro (1809); Intel i909900K, Noctua NH-D15S thermal solution, Gigabyte Z390 Aorus, 16GB (2x8) DDR4-2666 MHz memory, 512GB Samsung 850 PRO SSD, AMD Radeon RX Vega 64 GPU, graphics driver 18.30.19.01 (Adrenalin 18.9.3), Microsoft Windows 10 Pro (1809).

¹⁰ The information contained herein is for informational purposes only, and is subject to change without notice. Timelines, roadmaps, and/or product release dates shown in these slides are plans only and subject to change. "Rome" is a codename for AMD architectures, and not a product name. GD-122

¹¹ Based on AMD internal testing of the NAMD Apo1 v2.12 benchmark. AMD tests conducted on AMD reference platform configured with 1 x EPYC 7nm 64 core SoC, 8 x 32GB DDR4 2666MHz DIMMs, and Ubuntu 18.04, 4.17 kernel and using the AOCC 1.3 beta compiler with OpenMPI 4.0, FFTW 3.3.8 and Charms 6.7.1, achieved an average of 9.83 ns/day; versus Supermicro SYS-1029U-TRTP configured with 2 x Intel Xeon Platinum 8180 CPUs, 12 x 32GB DDR4 2666MHz DIMMs and Ubuntu 18.04, kernel 4.15 using the ICC 18.0.2 compiler with FFTW 3.3.8 and Charms 6.8.2, achieved an average of 8.4 ns/day. NAP-1112

¹² 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 minutes, 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

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