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# AMD debuts embedded EPYC and Ryzen processors

Embedded versions of EPYC and Ryzen processors fill in the gaps in AMD's portfolio, and putting even more pressure on Intel.



By [Adrian Kingsley-Hughes](#) for [Hardware 2.0](#) | February 21, 2018 -- 14:00 GMT (14:00 GMT) | Topic: [Hardware](#)



*Introducing EPYC embedded and Ryzen embedded*

Embedded versions of AMD's EPYC and Ryzen processors have landed, taking the Zen architecture to new places, filling out the company's processor portfolio, and putting even more pressure on Intel.

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The past year or so has been a busy time for AMD. Since the launch of Zen back in August 2016, we've seen the launch of Ryzen in December 2016, EPC and Radeon Vega graphics in June 2017, Ryzen Threadripper in August 2017, the first Ryzen with Vega graphics mobile parts in October 2017, and Ryzen with Vega desktop parts earlier this month.

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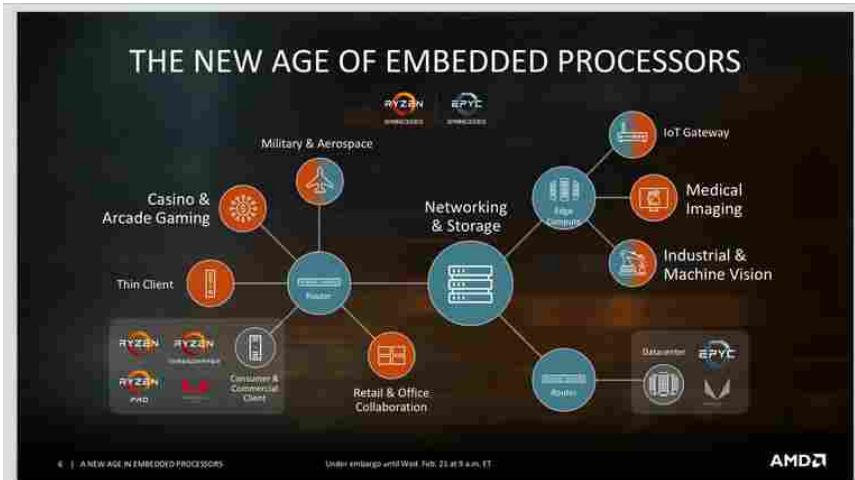
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*Zen timeline*

And the momentum continues into 2018.

While AMD has the desktop, laptop, and the server market well covered with this broad range of silicon, there are gaps. And it these gaps that the Sunnyvale chipmaker is filling in with embedded versions of its EPYC and Ryzen processors. These parts expand these chips into diverse areas such as casino and arcade gaming, thin client, 5G cellular, medical imaging, IoT gateways, and router.



Where embedded EPYC and Ryzen processors fit into the market

## EPYC EMBEDDED

Let's start with the new embedded EPYC parts - the EPYC 3000-series parts. And the highlights are impressive:

- BGA package (more suited to industries that demand higher reliability, such as medical, transportation, and military)
- Up to 16 "Zen" x86 cores
- Enterprise-grade reliability, availability, and serviceability (RAS)
- Up to 32 megabytes of shared L3 cache
- Maximum boost frequency of 3.1GHz
- Up to four memory channels
- Up to 1TB of memory capacity
- Up to 64 PCIe Gen 3 lanes
- Up to 8 10Gb Ethernet
- Up to 16 SATA or NVMe channels
- Product availability for 10 years

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All this is integrated into a SoC package, which means no chipset, and has built-in Secure Memory Encryption (according to AMD, this only adds some 1 to 2 percent overhead), Secure Encrypted Virtualization, and Hardware Root-of-Trust.

This series ranges from low-power 4-core/4-thread parts with a TDP of 35 Watts, to monster 16-core/32-thread 100 Watt TDP aimed at some serious heavy data lifting.

The complete line up of EPYC 3000-series processors is very strong, hitting all the wave crests of price and performance points:

**EPYC™ EMBEDDED 3000 SERIES**

Model #	Cores	Threads	TDP (W)	Base Freq (GHz)	All Cores Boost Freq (GHz)	Max. Boost Freq (GHz)	L3 \$ (MB)	DDR Channels	Max DDR Freq (10PC)	PCIe*	Tj (C)
3451	16	32	100	2.15	2.45	3.00	32	4	2666	x64	95
3401	16	16	85	1.85	2.25	3.00	32	4	2666	x64	105
3351	12	24	80	1.90	2.75	3.00	32	4	2666	x64	95
3301	12	12	65	2.00	2.15	3.00	32	4	2666	x64	95
3251	8	16	50	2.50	3.10		16	2	2666	x32	105
3201	8	8	30	1.50	3.10		16	2	2133	x32	95
3151	4	8	45	2.70	2.90		16	2	2666	x32	95
3101	4	4	35	2.10	2.90		8	2	2666	x32	95

Product plans and offerings are subject to change. AMD is under no obligation to notify customers of changes.

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**AMD**

*EPYC embedded 3000-series*

When the EPYC Embedded 3451 and 3251 are pitted against Intel's Xeon D-1587, and D-1540 (both older Broadwell parts, with Intel having rejigged its line up over the past few weeks), the AMD parts offers up to 50 percent more performance and up to 2.7 times the performance per dollar.



EPYC 3000-series performance leadership

Even when pitted against Intel's newer Skylake chips, when embedded EPYC parts are compared to Intel hardware such as the EPYC Embedded 3451 vs. Xeon D-2191 (\$800 vs. \$2,407), or the EPYC Embedded 3301 vs. Xeon D-2152IT (\$450 vs. \$438), the AMD parts consistently offer more, in the form of cores, cache, memory capacity, memory speed, PCIe lanes, and more 10Gb Ethernet either for the same amount of money, or a lot less.

AMD continues with the familiar drumbeat: More scale. More expansion. More memory bandwidth.

### EPYC™ EMBEDDED PERFORMANCE WHERE IT COUNTS

MORE scale, MORE expansion, MORE memory bandwidth

	AMD EPYC™ Embedded 3451		Intel Xeon D-2191
# of Cores	16		18
Frequency Base/Boost	2.15 / 3.0 GHz	MORE	1.6 / 3.0 GHz
L3 Cache	32 MB	MORE	24.75 MB
Mem Channels	4		4
Max Mem Capacity	1 TB	MORE	512 GB
Max Mem Speed	2666 GHz	MORE	2400 GHz
PCIe Gen 3	64 PCIe® Lanes	MORE	32 PCIe Lanes + 20 HSIQ
10 Gb Ethernet	8	MORE	4
List Price	\$880 USD		\$2,407 USD*

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EPYC embedded vs. Intel

### EPYC™ EMBEDDED POWERS THE HEART OF THE MARKET

MORE scale, MORE expansion, MORE memory bandwidth

	AMD EPYC™ Embedded 3301		Intel Xeon D-2142IT
# of Cores	12	MORE	8
Frequency Base/Boost	2.0 / 3.0 GHz	MORE	1.9 / 3.0 GHz
L3 Cache	32 MB	MORE	11 MB
Mem Channels	4		4
Max Mem Capacity	1 TB	MORE	512 GB
Max Mem Speed	2666 GHz	MORE	2133 GHz
PCIe Gen 3	64 PCIe® Lanes	MORE	32 PCIe Lanes + 20 HSIQ
10 Gb Ethernet	8	MORE	4
List Price	\$450 USD		\$438 USD*

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EPYC embedded vs. Intel

The embedded EPYC parts support a broad range of operating systems - RedHat's RHEL, Canonical's Ubuntu, Mentor's MEL, Wind's WindRiver, and Yocto Project's Yocto.

## RYZEN EMBEDDED

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Next up, the embedded Ryzen silicon - the Ryzen V1000-series APU.

Here are the highlights:

- Up to 4-core/8-thread 14-nanometer "Zen" cores with Radeon Vega graphics
- Dual-channel 64-bit DDR4
- Socket FP5
- Up to 3.6 TFLOPS performance
- 2x the performance compared to previous generation AMD R-series Embedded SoC
- Support for four 4K displays, along with 5K support
- 26 percent smaller footprint than corresponding Intel silicon packages
- 4K/60fps H.265 encode and decode and VP9 decode support
- Up to two 10Gb Ethernet ports
- HDMI 2.0b, eDP1.4 and DP1.4 support
- 12 to 54 Watt TDP range
- Product availability for 10 years

These APUs also feature Secure Memory Encryption, Secure Encrypted Virtualization, and Secure Boot.

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### AMD RYZEN™ EMBEDDED V1000 FAMILY

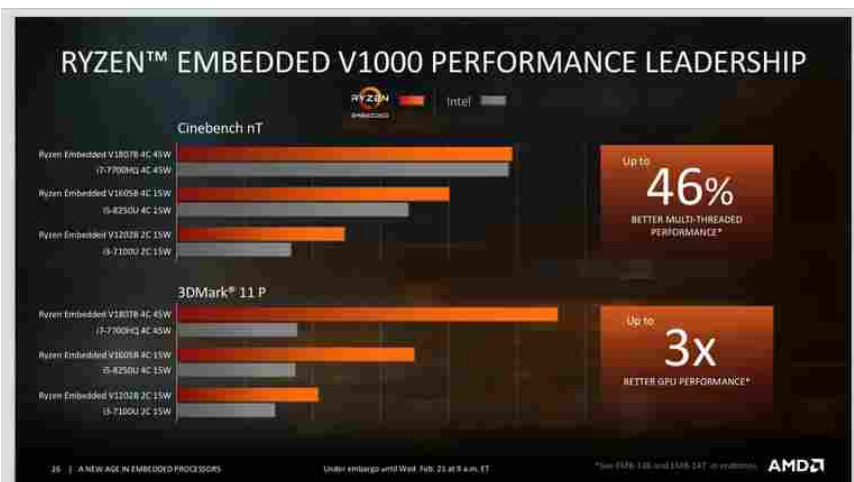
Model	TDP Range	Cores/Threads Count	CPU Cores (SMT)	Int. Cache (MB)	L2 Cache	Package	Max. DDR4 Rate	Base Freq. GHz	Boost Freq. GHz	GPU Freq. GHz	GPU Freq. GHz	Dual Ethernet Ports
V1807B	35-54W <sup>1</sup>	4/8	11	4	2M	FP5	3200	3.35	3.8	1.3	10Gb	
V1756B	35-54W <sup>1</sup>	4/8	8	4	2M	FP5	3200	3.25	3.6	1.3	10Gb	
V1605B	12-25W <sup>2</sup>	4/8	8	4	2M	FP5	2400	2.0	3.6	1.1	10Gb	
V1202B	12-25W <sup>3</sup>	2/4	3	4	1M	FP5	2400	2.3	3.2	1.0	1Gb	

Product plans and offerings are subject to change. AMD is under no obligation to notify customers of changes.  
<sup>1</sup> Default TDP = 45W.  
<sup>2</sup> Default TDP = 15W.  
<sup>3</sup> Default TDP = 15W.

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Ryzen embedded V1000-series

In benchmark tests (Cinebench nT and 3DMark 11 P) compared to equivalent Intel hardware, the V1000-series parts offer up to 46 percent better multi-threaded performance (although at the upper end the difference between the V1807B is pretty similar to Intel's i7-7700HQ) and up to three times better GPU performance.



Ryzen embedded V1000-series performance



The Ryzen Embedded V1000-series chips support the following platforms - Microsoft's Windows 10, Canonical's Ubuntu, Mentor's MEL, Wind's WindRiver Linux, and Yocto Project's Yocto.

The other day I had the chance to speak to Andrej Dvorak, CTO of **Esaote**, a maker of **diagnostic ultrasound systems**, and one of AMD's partners that has adopted embedded Ryzen chips to find out what attracted the company to the new silicon. Along with having a deep and infectious knowledge of medical devices, Dvorak had no problems ratting off a long and diverse list of reasons why **Esaote** turned to AMD for Ryzen Embedded V1000 APUs to power its new **MyLab 9 platform**:

- High performance for real-time processing of imaging, taking advantage of the rapid hardware innovation seen in the consumer space
- Lots of performance, with plenty of overhead for new features
- For smaller devices, more power, while for larger devices, the ability to make cooler, quieter machines
- Rapid boot times - down from minutes to seconds (vital for machines that need to be moved around and put into use rapidly)
- A software designed architecture means greater flexible and more the ability to be more responsive to market needs
- Future proofing, with the long 10 years lifecycle being of vital importance for medical customers

"As one of the top global providers of diagnostic **ultrasound** systems, it is imperative that **Esaote** partners with technology leaders that support the sophisticated signal and image processing needs as well as graphics display capabilities that doctors and technicians rely on to make critical diagnostic decisions," said Dvorak. "Not only does the new AMD Ryzen Embedded V1000 enable us to deliver world-class performance and crystal clear diagnostic images, the degree of integration allows us to develop more compact **ultrasound** systems that pack the performance punch of much larger machines, improving TCO for our customers and a better experience for patients, doctors and medical staff."

There are no shortage of other customers and partners leveraging embedded Ryzen parts, ranging from Seagate and ASRock to Asus and Sintrones.



Ryzen embedded V1000-series customers and partners

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