(Approx. 1745 words)

The AMD A10–7800 CPU

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November 2014 issue, The Databus
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Is your computer bogging down, perhaps not powerful enough to handle daily tasks or games? You've surely heard the old adage: "Take two aspirins and call me in the morning." In the same vein, folks often would upgrade both a video card and the processor to try to speed up their PC. Recently, processors began arriving that combined both a traditional CPU and video card (GPU) into one unit. The recently released AMD A10–7800 is one of these, called an APU, or accelerated processing unit.

Although my computer had a fairly competent processor (Phenom II x4), the motherboard's onboard graphics were very weak, to the point where I was seeing huge amounts of lag when I or my kids were playing some basic browser games. I'm one of those folks who like simplicity, so I've enjoyed watching as LAN cards, sound cards and even video cards have been integrated onto the motherboard. This was fine at first, but eventually I found myself wanting to upgrade the video capabilities, and I'd rather be able to do this without having to pull the motherboard or add a video card. I've had video cards in the past, but prefer the fanless variety since they don't add background noise, and there's no fan that can go bad. Silent video cards with huge heat sinks are more of a niche market today, so prices for better performers have climbed up between $75 and $100.

The AMD A10 range of processors offered exactly what I wanted, using the FM2+ socket. (first released earlier this year) The A10–7800 has what is probably the best built in graphics on a very competent but energy efficient processor. Since the graphics are built into the processor, there is no additional heat sink or fan required — it just uses the same heat sink fan that every CPU has anyway. Another advantage is that if I eventually decide to upgrade in a year or two, I can simply and quickly upgrade both the CPU and video elements of my system just by pulling the CPU and inserting a new one — no muss, no fuss.

My prior CPU was the Phenom II X4, running at 2.8 GHz. It drew 95 watts and put out quite a bit of heat. The first thing I noticed about the new A10 CPU was that the heat sink was about half the size of that required for the old Phenom II. I hadn't expected it to be much smaller, considering that now there was also essentially a video card crammed in there as well!

AMD's press release mentions that the processor supports UltraHD (4K) monitor resolutions. The A10–7800 (formerly known as Kaveri) also is touted as having 12 compute cores — 4 CPU and 8 GPU. It runs at a base clock frequency of 3.5 GHz,

activating a turbo frequency of 3.9 GHz if an application is demanding. It has 512 video shader cores and a listed 65 watts of drawn power. Also incorporated is AMD TrueAudio, a built in DSP processor that provides dedicated positional sound effects calculation (including echo, etc.) for games. At the time of this writing, the processor is available for around $140.

As I had mentioned, my main reason for wanting an upgrade was extreme slowdown/lag when playing browser games. I had also noticed an occasional lockup once or twice a month, and decided it was time to install new components. I used Browsermark and PCMark 8 to compare my system before and after the upgrade. Originally I had the AMD Phenom II x4 925 CPU and onboard Radeon HD 4250 video.

Phenom II x4 925 (4 core, 2.8 GHz, 95 watt)	A10-7800 (4 core, 3.9 GHz, 65 watt)
Winrar 156 Megabyte compress 109 seconds	114 seconds
Hyper Pi 8m calc., 22 iterations 5 min. 26 seconds	--- 4 min. 26 seconds
142 Watts full load, 83 W at rest	---------- 115 Watts full load, 60 W at rest
# of transistors: 758 million	---------- # of transistors: 2.41 billion
PCMark 8 casual Gaming 7.8 fps	---------- 28 fps
Browsermark Score 1,888	---------- 3,758

(full load *vs.* at rest tested using Handbrake, h.264/mpeg4 video, doesn't include monitor)

I performed a variety of benchmarks, such as using Winrar to try to compress a 156 Megabyte video file. This may not have been the best choice of file, since they are already highly compressed, but the resulting times were very close, even though the newer CPU clearly uses a lot less power to do the same job. Hyper Pi, which calculates Pi using as many cores as the CPU possesses, showed a marked improvement over the old Phenom II.

If you'll refer to the chart above, you can see that the A10–7800 has roughly three times as many switches/transistors as the Phenom II 925 did. To put that in perspective, my first computer, a TI 99/4a from about 1982, had a CPU with 8,000 transistors, while my first IBM clone in around 1990 had 275,000. Put another way, let's say that each switch represents a person. In that case, my first PC had close to the equivalent of my home town's population toiling away in there, while today it is roughly the equivalent to the population of Asia. Clearly, it won't be too long before there are more switches in my computer's processor than there are people alive.

I was also able to borrow a "Kill A Watt" energy testing outlet device from my Dad to get some interesting readings. For example, now I know that my monitor uses up about 27 watts, with the PC using another 60W when the system is not doing much of anything at the desktop. Without the monitor, the new A10 based system uses 115 watts when doing mpeg4/h.264 video file encoding, vs 142 watts on the old Phenom II system. With the side of the case cover off, I definitely could hear the APU fan become a bit noisier during the video encoding, (when the processor kicked into 3.9 GHz turbo mode) but it wasn't noticeable at all with the case closed. Considering the performance per Watt

used, this would be a great choice for a power limited system — if you want to upgrade capabilities without having to upgrade a system's power supply, for example.

Browsermark showed roughly a doubling of ability, while PCMark 8 showed nearly a quadrupling of casual gaming frames per second. Ultimately, I got what I wanted out of the upgrade — browser games are playable again, with no lag for detailed animations in games and such. The system now also has the capability of playing various games with 3D effects, such as mrst and third person shooters — something I definitely could not have done on my old system.

It wouldn't be fair to finish this review without at least trying a few games. The A10–7800 was able to handle a game called *King's Bounty* that needed a video card upgrade to play about three years ago, due to numerous rendered battle animations. For the past decade, many of the first and third person shooters and other 3D games have used the Unreal Engine. (UE) I downloaded game demos using the UE2, which was used to make many games from about 2003 to 2008, and the system worked flawlessly. I tried another game that was made with UE3, which was used from about 2009 to present, and again, it did a decent job, but not at the highest resolutions.

The next version of the Unreal Engine is UE4, which is currently being used by developers to make games that will come out starting in 2015, and probably for the next 5 years or so. Using a recently released demo of UE4, I was only able to get frame rates of about nine to fourteen frames per second, which is not playable. However, it is still orders of magnitude above what I would have gotten with any motherboard's onboard graphics, and probably about 15% better than a stand-alone R7 240 video card.

To be fair, the UE4 development system is meant to push even high end video cards at this point — cards that probably cost more by themselves than this processor does. It makes sense for them to do this, because it usually takes at least a couple of years to develop the games. Also, today's $350 Radeon R9 or Geforce GTX video cards will be equivalent to a middle of the road $120 card 3 or so years from now.

APU's such as the A10-7800 are very unlikely to ever interest either of these two groups: overclockers or video card enthusiasts. AMD wasn't going after either of these markets, so it shouldn't be a surprise. What AMD wanted to do was to offer a relatively inexpensive option for people who like to have what you might consider some mid-range graphics built into the processor. Intel has also started doing this, with Intel graphics built in to a number of their processors now. At least for present, AMD definitely has the upper hand as far as video game framerate on these, however. Looking over numerous online benchmarks, I found that the Intel processors could crunch numbers a bit faster, but that the AMD APU's often had double the game framerates. I guess if you spend most of your time compressing files or doing intensive calculations, Intel might be a better choice. However, if anyone in your house plays games, the AMD APU would probably be a better investment.

In a nutshell: I give the A10-7800 a 9.5 out of 10 for energy efficiency and for being able to cram this much video processing ability into an APU. It would probably play 95% of the games out there currently, and you could easily spend $60 to $70 on a stand-alone video card that would not outperform this. That said, this is probably a better choice for those who occasionally try first person shooters, considering that it is unlikely to perform well in graphics heavy titles coming out in 2015 and later. For those who leave their PC’s on all the time, the savings on an electric bill alone would likely pay for the cost of the A10-7800 in one or two years. This is especially true if your current system has older (released 2010 or before) stand-alone video cards or processors that draw 90W or more.