Guest Column

March 23, 2016

5 Years of APUs: A Retrospective

By Bob O'Donnell

Sponsored by AMD

My how things have changed. Five years ago, the possibility of combining a fully-capable CPU and fully-capable GPU on the same piece of silicon was just becoming a reality. Now, this Accelerated Processing Unit, or APU, concept is considered so commonplace, that essentially everyone is doing it.

The reason for the change, of course, is graphics. Though the visual elements of computing have always been a central part of the experience, for a very long time, the kind of graphics driven by a GPU were considered by many to be more of an "extra" that only gamers or specialists really needed.

Today, that is not the case. High-resolution graphics are at the very heart of virtually every aspect of the computing experience, from basic user interface elements, through viewing HD and 4K videos, and beyond. Oh yeah, and they're pretty important for games too!

High quality graphics have gone mainstream and computers without the appropriate graphics hardware now often seem sluggish and inadequate, even for everyday tasks. Software application and OS developers have leveraged the large installed base of powerful graphics hardware-based PCs to enable a wide range of visual environments and attractive graphical tricks that make the experience of using a modern PC more appealing.

In addition, we've seen the development of incredibly sophisticated visuals for computer and console-based games, which are able to use this APU-based graphics hardware to its fullest extent. Given the enormous and growing popularity of computer-based gaming through things like on-line game streaming and the entire eSports phenomenon, this kind of hardware has clearly caught on with the mainstream public.

Looking back at these developments now, the need for integrating higher-quality graphics with CPUs may seem rather obvious, but that wasn't always the case. To their credit, AMD foresaw the merging and melding of CPU and GPU technologies more than a decade ago and started on the path to integrate these elements way back then. The first fruits of their labor—the first generation APUs (codenamed "Llano" and "Brazos") made their debut just over five years ago at the 2011 CES trade show in Las Vegas.

Since then, the company has continued to iterate and improve on the idea, resulting in several generations of APUs—including today's 6th Generation APU, codenamed "Carrizo" —all of which build on the original concept of having a CPU and an APU on the same silicon.

In fact, while the history of APUs has been primarily focused on graphics, arguably the future of APUs will be driven primarily by advancements in computing. Leveraging both the CPU and the GPU to do more functions that have traditionally only been done by the CPU is the next logical development for APUs. Steps have already been taken in this direction, but arguably it took some of the technical advancements in later generation APUs—things like heterogeneous memory management and GPU context switching, for example—to really enable the full potential of this modern computing model.

Once again, AMD foresaw these developments and established the HSA (Heterogeneous System Architecture) Foundation to help drive standard means of sharing CPU and GPU compute resources. The HSA Foundation's work is enabling software developers to smartly use the unique strengths of each component in order to tackle even more complex tasks, like machine learning, as well as speed up the completion of existing tasks. In addition, the raw computing horsepower in the GPU portion of today's APUs is driving some extremely important advances in the sciences, enabling developments in medicine and other fields that can have a positive impact on our lives to occur at a more rapid pace.

Creating software that can really leverage the heterogeneous computing power of an APU hasn't been easy because it requires a very different way of thinking and different sets of development tools. As a result, it's taken a while to get some of these projects going, but the efforts are starting to pay off. New programming languages and tools which can take advantage of this architecture are now commonplace, and the net result is a promising future for the APU and the capabilities it will bring to mainstream PC users.

Bob O'Donnell is the president and chief analyst of TECHnalysis Research, LLC *a technology and market research firm that provides strategic consulting and market research services to the technology industry and professional financial community. You can follow him on Twitter @bobodtech.*