Look at AMD Before Thinking It Should License ARM

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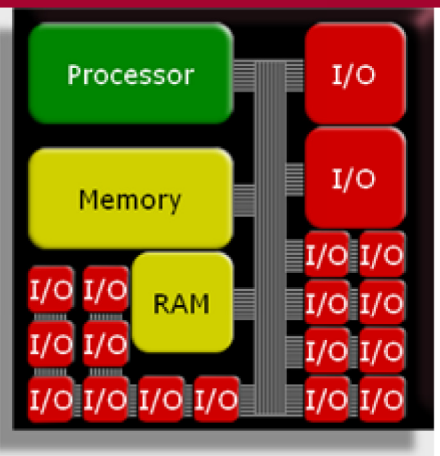

Commentary on Wild Speculation

A story in EETimes on April 27, 2011 mulled over the idea of AMD licensing one of the ARM processor architectures (Article Here). There is no announcement pending but the story rings a little of Orson Welles fooling US audiences with The War of the Worlds in 1938. The story comes under a heading of "Analysis" but if a few words are missed, one could think there is some real possibility that AMD might engage with ARM. Objective Analysis doubts that this will happen.

There are many difficulties with AMD licensing ARM at this point. Yes, ARM would love for AMD, General Motors, or any other company to license its architecture. That would be good for ARM, and AMD is just across town from ARM's Austin and San Jose facilities. But AMD is in a very different world than ARM, and it is not clear how AMD would use an ARM core in its existing markets or be effective in any other market.

AMD - Out of ARM's Way

What would AMD bring to an ARM party? About the only thing would be a mythical multi-processor chip that had an x86 and an ARM core on it, but for what purpose and to serve what booming market? AMD has a variety of processors already, primarily focused on high performance. It has multi-core. It has graphics processors. It has high-speed I/O. It has bridges and all the things that are great for PCs and servers and maybe the sideline of embedded PCs and boards. It has a relationship with Microsoft.

But what market would AMD chase with ARM? Certainly not PCs as the main processor. Will a company buying an AMD 64-bit server today buy an AMD ARM-based server that runs on less energy tomorrow? That's a totally new paradigm that is completely unproven. Indeed ARM needs to flex its muscle better in the server area where it is deserving. AMD might be able to effect that, but maybe what's really needed is for the entire paradigm to shift with a totally new chip supplier that doesn't have the baggage, distraction, and conflict of x86 business chasing the same market. At the other end of the spectrum, this same conflict would dog AMD pushing ARM into tablet-like devices.

Let's not forget, AMD has had a low-power non-x86 core for well over a decade. It bought the old Alchemy (what a name!) and basically went nowhere with a superb low-power MIPS architecture. So it has no track record outside the arm's reach ... hand's reach of the PC.

Would AMD chase cell phones with ARM? Remember Intel tried that with the other side of DEC and in spite of doing a pretty fair job of the technology and using a little muscle with its market presence, Intel still ended up bailing out of the XScale business, selling it to Marvell. AMD would start this same path flat-footed in cellular or most anything consumer-oriented. Consumers might know AMD as the other guy in PCs but that is about it. HP failed to make a mark as a consumer electronics OEM selling TVs and such, and HP was at least a little closer to the consumer to start, since it was the OEM (not the chip vendor) selling PCs that consumers might buy. And AMD has nothing like the marketing budget that Intel or HP has.

One of the ARM Crowd

AMD with an ARM license would be just another ARM licensee, like virtually every other semiconductor vendor in existence. But what will AMD do with the architecture? While the licensing fees and engineering services charges are good for ARM, ultimately ARM needs long term royalties from end-product sales. Clearly that figure will be zero from AMD if they are not a licensee, but one wonders how much higher royalties will be if AMD does license ARM.

The other hundreds of ARM licensees have firm footholds, or at least dreams, in marketplaces to which they are bringing ARM products: embedded processors, microcontrollers, applications processors, ASICs, FPGAs, dedicated circuits, custom silicon, data plane processors needing control, Wi-Fi transmitters needing management, automotive subassemblies, fabs hawking design services, video games, navigation systems… maybe just design houses… the list or companies and applications seems endless. AMD's markets surround PCs.

AMD Rudderless

AMD direction and management is up in the air. They have struggled to distinguish themselves or take market share from the 600 pound gorilla. Intel has responded every time it looked like it was being up-staged, usually with good results, and eventually regaining any market share losses. Management at AMD has been in flux at many levels for many years now, nearly since Jerry Sanders stepped away. The ship seems a bit adrift the last year or so with Hector Ruiz dropping out, some top designers seeking more promising projects, and the difficult assimilation of graphics company ATI. Transitioning out of "real men's" fabs to consortiums and eventually Globalfoundries may have saved some expenses, or at least moved them around on the balance sheet, but most semiconductor companies have taken similar steps. Such activities consume a lot of manpower that is sideways in motion rather than forward. Does AMD need a new processor architecture at this point too?

Essentially all of AMD's energy since the 1980's has been devoted to PC markets and the x86. There was more, in the dark ages, like the 29K and aforementioned MIPS processors that established some markets (29K particularly in printers), but the big money and focus of AMD has clearly been PCs and servers. It is really hard to see how AMD would fare in the real embedded systems business.

Indeed, this analyst himself has said publicly that ARM is a processor architecture that should be considered by the "board business" - high-performance computer systems ready to be slid into a chassis and configured with software to perform designated computing operations. Linux and operating systems other than Windows may run those. The ARM architecture is just too significant to be ignored even this close to a generic PC. The question is whether a company like AMD could be successful pushing a new architecture into the sockets formerly occupied by its bread and butter architecture. Again perhaps a different company, a new company to the ranks, has a better chance of supporting the ARM architecture because would have everything to lose.

Architectural Differences

AMD's influence on software has been mentioned with regard to the x86, Microsoft, and ARM. AMD has primarily played second-fiddle at Microsoft, with Intel taking first chair. Other architectures are virtually in another building with regard to Windows of any form, even though for 20 years Microsoft has promised, attempted, re-entered, and redressed Windows in numerous forms for enbedded MIPS, PowerPC, ARM and assorted other architectures, largely without success. It is hard to see how AMD knocking on Microsoft's door asking for a good Windows implementation on ARM would greatly sway Microsoft or the market to follow the idea. After all, Intel was doing just that five years ago with its XScale version of ARM.

Just in case one of our readers is new to processors, there is zero in common between an x86-architecture-based processor and an ARM architecture. Current x86

implementations certainly use RISC techniques, but they were originally complex instruction set computers (CISC) developed in the 1970's. At least the "R" in ARM once stood for RISC (reduced instruction set computer) and while based on a design from the 1980's, ARM processors are clearly RISC machines advanced to the modern era.

Any software written for Windows as an operating system and/or an x86 processor would require a huge amount of re-work, testing, and validation if it was compiled to an ARM architecture with the hope to operate in the totally foreign environment. Probably 80% of the knowledge about and experience from working on x86 systems would be useless in the design of an ARM-based system, whether that is hardware or software or chips or systems. The domains are not quite as foreign as digital signal processor (DSP) and microprocessor (MPU) but they are nearly that far apart.

From a system level, AMD would have similar disparities in building an ARM-based processor which addresses memory and I/O in another manner and would utilize cache differently. It is a very different approach hardware- and software-wise.

Intel Needs an Adversary

One particularly sticky area when thinking about AMD walking away from the x86 architecture (which is not really being suggested by anyone) is that Intel needs AMD, and so do the rest of us. Without some balance in the market, there are not enough market forces to keep prices down while technology advances. VIA Technology is barely visible in x86 shipments and it is focusing on that embedded PC space, so if AMD lost much market share, then Intel would hold too much influence over an extremely large market. Even though this might be deserved, it is not the sort of thing the US Department of Justice (DOJ) likes to see.

Computer and server buyers would not like to see prices rise just because there was inadequate competition to force prices downward - prices that are already higher than their transistor count might justify. It is also important that Intel keep running as fast as it reasonably can to keep processor technology advancing, and there's nothing like a vicious competitor to keep designers at their sharpest.

If AMD slowed down significantly, lost interest in the PC industry, or even went bankrupt, then perhaps the worst case scenario would begin. If the DOJ decided that Intel was too dominant and without competition, even if it got that way by being on top of its game, brilliant in execution, and flat-out determined, the DOJ might try to break up Intel or force sharing of its secrets. The PC industry is what it is today because technology and the market forces of capitalism have worked very well, and the world is far better because of it. To tinker with that picture with government intervention would have, in this analyst's view, disastrous consequences. But if AMD stumbles too much, it would be incumbent upon Intel to be sure its customers are happy in terms of both technology advances and pricing to keep the government bodies from feeling like they need to step in.

ARM at AMD? Answer the Questions in the Right Order

Should ARM be at AMD? First some other questions need to be answered.

- What direction is AMD headed?
- What products will AMD build to get there?
- What is the best processor architecture to get there?

If the answer to the third question is "ARM is the architecture to win that market," then AMD should invest in the ARM architecture. That starts with a license for the intellectual property (IP) and requires large teams of dedicated people, software development, and chip design that is likely to be very different from AMD's x86 experience. It will also require a commanding influence on the end market and aggressive marketing, because there are numerous competitors out there selling ARM-

based semiconductors into virtually every electronics market imaginable.

ARM has built a formidable customer base in the last 20 years, making it almost foolhardy for anyone else to try to design and support a new general-purpose processor architecture at the present. Would ARM like to have AMD as a licensee? Absolutely! It might be especially good for AMD to have an architecture license (which allows them to tailor the fundamental architecture) since AMD probably has unique expertise in very high performance (multi-processing?) systems that other ARM licensees do not have. But for the effort to really pay off, AMD is going to have to find a viable application for the ARM architecture where AMD can expand. If that application just added one ARM processor operating as, say, an I/O processor in all AMD-based PCs or servers, then that mean selling 25-50 million more ARM processors. That is not bad incremental business for ARM, and might give AMD-based PCs/servers an extra quality, but it may not be a sea change in the PC/server industry either.

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