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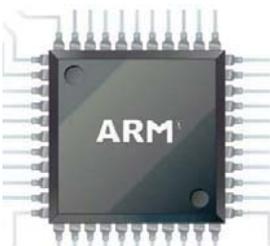


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July 18, 2013

## HPC to Ride ARM's Lengthening Tail

As we move toward a new era of 64-bit ARM-based processors, the role of ARM in future HPC environments has been the subject of a great deal of speculation. With that said, there have already been a number of notable research and practical endeavors to explore how ARM might find a way into HPC.



For instance, a team from the Barcelona Supercomputer Center recently [explored the role](#) (<http://www.montblanc-project.eu/sites/default/files/publications/armhpc-sc.pdf>) of low-power servers for HPC applications, which also the center of a [popular ISC session](#) ([http://www.isc-events.com/isc13\\_ap/presentationdetails.php?t=contribution&o=2104&a=select&ra=eventdetails](http://www.isc-events.com/isc13_ap/presentationdetails.php?t=contribution&o=2104&a=select&ra=eventdetails)) along the same lines. Others, including NVIDIA, are looking at making a GPU ARM sandwich (Project Denver) for high performance with a focus on lower power consumption. And, of course, just about everyone with an ARM license is looking at ways to target the current core, I/O and other limitations.

Even with these developments in the works in advance of the 64-bit ARM explosion around 2014, the talk about ARM is just that--chatter. While we discussed this in the context of low-power approaches from HP with its Moonshot offerings (which offer some flexibility for HPC users--at least eventually) and AMD's strategy around new datacenters, we got a fresh perspective recently from Calxeda's Karl Freund.

Freund has seen a number of server trends rise to the top before fizzling--not to mention some that are still tenaciously clinging on. He's evangelized the IBM System Zs as well as Big Blue's Power systems and Tivoli products as well as the systems of other HPC-relevant companies, including SGI, HP (on the workstation side) and Cray Research.

Calxeda is one of a growing number of licensees for the A57 technology from ARM and are going to build a 64-bit platform. While he admits that HPC isn't where they are directly focused for this eventual rollout, he sees a future where ARM has a strong role--but, of course, there's some work to be done first. Certainly their A9 product, which has seen solid uptake from partners including Dell, HP, Penguin, and others, has a limited role in HPC, but the efficiency numbers should make the supercomputing folk, with their visions of exascale, sit up and take notice.

Freund knows there is likely to be an intense battle between ARM-based vendors, some of whom will focus on specific areas (including HPC) while most others after the larger datacenter market. All will be using the same A57 cores from ARM--the differentiation will come in the addition of cores, interconnect and management possibilities, he notes.

Although efficiency is the name of the game, there is, at this point anyway, a rather dramatic performance difference between high core-count and clock rate chips and their ARM cousins. Freund agrees the addition of double-precision capability, interconnect developments and a new slew of architectural license-driven creations could bring ARM to the forefront, even for the small slice of the overall datacenter market that is HPC.

With all of this in mind, it's not realistic to think that in three years the Top 500 will be dominated by low-power processors, but Freund says there is a definite place for them handling the data-intensive needs of exascale systems. For instance, one of the big issues that the exascale era will bring will be around processing the massive log files. It makes sense for supercomputing sites to offload this to efficient ARM-powered machines, especially once the performance gap closes to some extent.

Freund pointed to the Square Kilometer Array (SKA) and several national labs that are looking to ARM for their data-intensive needs, at least as concepts. "There are a number of sites that have expressed interest in using ARM to power their dig through massive log files on exascale-level systems or for large research projects."

These are still early days for ARM performance developments, but as the ecosystem matures with the addition of 64-bit capability and new enhancements, Freund predicts as much as a 17-fold increase in floating point performance. To be fair, the bar is rather low, so these massive leaps will eventually temper out as they have for other chipmakers. Still, Freund claims that ARM has a new set of possibilities to counter the slowdown in the core and clock wars Intel is fighting.



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