THIS WEEK IN HPC: INTEL OMNI-PATH BUILDS BRIDGES AT PITTSBURGH SUPERCOMPUTING CENTER

Addison Snell

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PODCAST

The following is a transcript from the weekly Intersect360 Research podcast, This Week in HPC*, available on iTunes, Stitcher, and through our media partnership with TOP500.org. The full podcast can be found at http://www.intersect360.com/industry/podcasts.php and is hosted at http://www.top500.org/blog/intel-omni-path-builds-bridges-at-pittsburgh-supercomputing-center/.*

In this special podcast episode, originally published on April 29, 2016, host analyst Addison Snell interview Barry Davis, General Manager, High Performance Fabrics, Intel Corporation, and Nick Nystrom, Ph.D., Principal Investigator for the Bridges supercomputer at Pittsburgh Supercomputing Center, concerning the bring-up of Bridges and first experiences with the Intel Omni-Path Architecture.

Addison Snell: I have two guests with me for this special sponsored episode. The first is Dr. Nick Nystrom, who is the Senior Director of Research and the Principal Investigator for the Bridges Supercomputer at Pittsburgh Supercomputing Center. Nick, thanks very much for joining us.

Nick Nystrom: Thank you, Addison.

AS: And my other guest is Barry Davis, who is the General Manager for High Performance Computing and Fabrics at Intel. Barry, thanks for getting on the line here.

Barry Davis: Thanks, Addison. I'm glad to be here.

AS: The big thing I wanted to talk to both of you about is this Bridges supercomputer and, in particular, the role for Intel Omni-Path architecture. Now, Omni-Path was released to much fanfare at the SC15 conference, so the big question everyone wants to know is, how's the adoption of it going so far? So, Barry, how are things going?

BD: You know, Addison, it's going fantastic. The Bridges installation late last year was actually our first install, so we're very excited about that. But after that, it's taken off like a rocket. We had a phenomenal first quarter in terms of our shipments, we're having great success across every single geographical area around the world. We basically have design wins, and many of those are actually being installed today, in every major geo. Some examples are, of course, the Bridges cluster at Pittsburgh Supercomputing; we're installing today the CTS-1 for the Department of Energy Tri-Labs; we've got design wins in the CINECA cluster design win being built up in Italy today; we've got multiple designs in Europe; there's a very large cluster that we just won in Japan (unfortunately I can't talk about it today but there'll be press releases coming out on that very shortly). But the success has just been well above our expectations and we're excited about that.

AS: You know, it's something that we of course will track – Intersect360 Research looks at the adoption of new technologies in HPC. We're about to launch our new HPC User Site Census Report, so we'll be able to track some of those early adoptions. We have been looking at people's forward-looking impressions of it going back a couple of months, and we've seen that people do have positive impressions of it going forward; that it's up for a lot of evaluation. There's also an Intersect360 Research white paper on Omni-Path shortly to be available at www.Intel.com/hpcfabrics for our readers.

But when we look at the actual evaluation of Omni-Path, Nick, that's something that goes right into your bailiwick. You're an early adopter – one of the earliest adopters – of Omni-Path. How did you go through that evaluation process?

> ***"People have positive impressions of Omni-Path going forward. It's up for a lot of evaluation."***
>
> ***– Addison Snell***

NN: Well, Bridges is a unique system – it is funded by the National Science Foundation – with a unique mission. And its mission is to serve communities who have not traditionally used high performance computing. What a lot of those communities need is really to converge HPC and data analytics, because their research is all about Big Data. So when we were looking at a fabric for what is the new NSF supercomputer for the national community, we were looking at something that we can very flexibly build a very large system with, where the price/performance was such that we can maximize compute and storage and bandwidth and spend less on the network, but still deliver very high performance. Those were the things we were looking at.

AS: The Bridges supercomputer not only was built on Intel Omni-Path architechture, also quite notably has HPE servers. What's been your experience with that system during the bring-up?

NN: Oh, well that's a great question. Bridges has three tiers of very large memory HPE servers. We have Apollo 2000s with 128 Gigabytes each, ProLiant DL580s with 3 terabytes each, and HPE Integrity X-Servers, with 12 Terabytes of RAM each. And so we had to couple those with a fabric. Our experience with all of them has been great.

We began our early user period not with what some sites call "friendly users;" we invited everyone. And we did that because the fabric and the servers were both proving to be so solid that we could just invite everyone who had allocations and let them begin doing their research. We did that on a Friday and by Sunday, we already had someone writing to us, sending a visualization, saying, "I've already accomplished a research result."

AS: Something like a fast bring-up is always notable in a noteworthy supercomputer like that. Barry, Intel must have been looking for who they wanted their high-profile early installations to be. What do you think of this Bridges computer?

BD: This was really a result of a couple things. First off, HPE, or Hewlett-Packard Enterprise, is one of our closest partners. They partnered with us on Omni-Path very early on in the program, and I think what you're seeing here is a result of that. We've worked closely with them, we worked closely with the customer, Nick and team, and it's that collaboration between the three of us which really brought this

Intersect360 Research
P.O. Box 60296 | Sunnyvale, CA 94088 | Tel. [888] 256-0124
www.Intersect360.com | info@Intersect360.com

cluster to bear in such a rapid fashion. But I must say that even we were surprised at this. It does speak to the stability and the robustness of the Omni-Path architecture.

AS: Nick, you were describing these different tiers – you've got some nodes that are fat nodes with big memory, you've got some that are Big Data focused, you've got storage nodes, you've got a PSC file system – what kind of applications are you looking for, and are there any early results we should be looking for from Bridges?

NN: In fact, there are. The applications we were looking for really span the whole range of research. They are non-traditional things in life sciences, social sciences, humanities, but they are also new ways of approaching traditional HPC, and of doing traditional HPC.

As an example of recent results, Ping Ma and Wenxuan Zhong, these are researchers from the University of Georgia, have done a large metagenomic assembly of bacteria from the intestinal tract of healthy patients and other patients with diabetes. This was a really aggressive simulation or calculation where they were looking at 378 billion base pairs. For scale, remember that the normal human genome has 3 billion base pairs, so this is the equivalent of doing over a hundred human genomes at once.

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AS: Right, you said it was a metagenomic simulation. Putting that meta tag on it; we've seen a lot of genomics in HPC but presumably by metagenomics you mean something more complex or involved.

NN: Yes, exactly. Metagenomics is looking at genomics of all the species living in an environment at once. So when you're looking at the gut microbiome, which is what a lot of researchers are interested in now because a lot of diseases, cancer susceptibility, cancer resistance, seem to be tied to the gut microbiome – what all is living in each of us – and that varies from person to person. There, you can't separate a priori the different kinds of bacteria that you have. Instead, you have to do the genome sequencing on all of it at once. So it's like not solving one jigsaw puzzle, but solving a hundred or a thousand jigsaw puzzles all mixed together at the same time.

AS: Barry, this really winds up looking like the new face of HPC going forward, with these new kids of applications that are now enabled.

BD: That's right. And we've looked at the future in terms of performance requirements, in terms of price/performance requirements, and these are some of the factors that we built in to the architecture to really service our customers, in this case Hewlett Packard [Enterprise] and Pittsburgh Supercomputing, but it's all about being able to provide the right level of performance at the right price point for the scientists to be able to perform these calculations, these simulations.

AS: And of course, a major theme that we hear talked about is making HPC more accessible, as Nick was saying, to more of these different types of applications, new types of sciences. You really are building

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more of an HPC community of applications around these efforts. Nick, how has the response been from the greater community?

NN: The response has been phenomenal. At the last point I looked, which was late last week, we had 196 separate projects allocated on Bridges. More are coming in rapidly. The early response – we surveyed early users as to how satisfied they are on a scale of one to five with the hardware and the usability and reliability of the system, and the score we got back – these are completely new users, they had very high expectations – and the score they gave back was a 4.3, which is outstanding.

AS: As someone who does market research for a living, I will tell you that is an exceptionally high score. It's hard to get those solid scores over four on a five-point scale.

NN: Again, this was unbiased. We invited all users who had allocations. Those who wanted to come right away, did. And of those users, we invited them all to take this survey, and those who wanted to, did.

> ***"The success of Omni-Path has been above our expectations, and we're excited about that."***
>
> ***– Barry Davis***

AS: You had a hackathon as well, didn't you?

NN: We did. That was actually our first event on Bridges. In late February, we had the Midas Mission public health hackathon, where researchers from around the U.S. and India competed to produce visualizations of public health data. That was the first real hands-on user event on Bridges. It was a two-day event, it went completely smoothly without a hitch.

BD: That's great. We heard a lot about that, Nick, and that was just a phenomenal success.

AS: We've been speaking with Barry Davis, the general manager of HPC compute and fabrics at Intel, and Nick Nystrom, the principal investigator for the Bridges computer at Pittsburgh Supercomputing Center. More information about Intel Omni-Path is available at www.Intel.com/hpcfabrics. Thanks for tuning in. You've been listening to *This Week in HPC*.

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