Interviews with Steering Committee Members: Michael Resch, University of Stuttgart

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IN THIS UPDATE

After the global pandemic forced Hyperion Research to cancel the April 2020 HPC User Forum planned for Princeton, New Jersey, we decided to reach out to the HPC community in another way – by publishing a series of interviews with members of the HPC User Forum Steering Committee. Our hope is that these seasoned leaders' perspectives on HPC's past, present and future will be interesting and beneficial to others. To conduct the interviews, Hyperion Research engaged insideHPC Media. We welcome comments and questions addressed to Steve Conway, sconway@hyperionres.com or Earl Joseph, ejoseph@hyperionres.com.

This interview is with Michael Resch. Prof. Dr. Dr. h.c. mult. Michael M. Resch is dean of the faculty for energy-process and biotechnology of the University of Stuttgart, director of the High Performance Computing Center Stuttgart (HLRS), the Department for High Performance Computing, and the Information Center (IZUS), all at the University of Stuttgart, Germany. He was an invited plenary speaker at SC'07. He chairs the board of the German Gauss Center for Supercomputing (GCS) and serves on the advisory councils for Triangle Venture Capital Group and several foundations. He is on the advisory board of the Paderborn Center for Parallel Computing (PC2). Michael Resch holds a degree in Technical Mathematics from the Technical University of Graz, Austria and a Ph.D. in engineering from the University of Stuttgart. He was an assistant professor of computer science at the University of Houston and was awarded honorary doctorates by the National Technical University of Donezk (Ukraine) and the Russian Academy of Science.

The HPC User Forum was established in 1999 to promote the health of the global HPC industry and address issues of common concern to users. More than 75 HPC User Forum meetings have been held in the Americas, Europe and the Asia-Pacific region since the organization's founding in 2000.

MICHAEL RESCH INTERVIEWED BY DAN OLDS, insideHPC

Olds: Hello, I'm Dan Olds on behalf of Hyperion Research and insideHPC, and today I'm talking to Michael Resch, who is an honorable professor at the HPC Center in Stuttgart, Germany. How are you, Michael?

Resch: I am fine, Dan. Thanks.

Olds: Very nice to talk to you. I guess let's start at the beginning. How did you get involved in HPC in the first place?

Resch: That started when I was a math student and I was invited to work as a student research assistant and, by accident, that was roughly the month when a new supercomputer was coming into the Technical University of Graz. So, I put my hands on that machine and I never went away again.

Olds: You sort of made that machine yours, I guess?

Resch: We were only three users. There were three user groups and I was the most important user of my user group because I did all the programming.

Olds: Fantastic, that's a way to make yourself indispensable, isn't it?

Resch: In a sense.

Olds: So, can you kind of summarize your HPC background over the years?

Resch: I started doing blood flow simulations, so I at first looked into this very traditional Navier-Stokes equation that was driving HPC for a long time. Then I moved on to groundwater flow simulations – pollution of groundwater, tunnel construction work, and everything – until after like five years I moved to the University of Stuttgart where I started to work with supercomputers, more focusing on the programming side, the performance side, than on the hardware side. This is sort of my background in terms of experience.

In terms of education, I studied a mixture of mathematics, computer science, and economics, and then did a Ph.D. in engineering, which was convenient if you're working in Navier-Stokes equations. So, I try to bring all of these things together to make an impact in HPC.

Olds: What are some of the biggest changes you've seen in HPC over your career?

Resch: Well, the biggest change is probably that when I started, as I said, there were three user groups. These were outstanding experts in their field, but supercomputing was nothing for the rest of the university. Today, everybody is using HPC. That's probably the biggest change, that we are moving from something where you had one big system and a few experts around that system, and you moved to a larger number of systems and tens of thousands of experts working with them.

Olds: And, so, the systems have to get bigger, of course.

Resch: Well, certainly, they have to get bigger. And they have to get, I would say, more usable. That's another feature, that now things are more hidden from the user, which makes it easier to use them. But at the same time, it takes away some of the performance. There is this combination of hiding things away from the user and then the massive parallelism that we saw, and that's the second most

important thing that I think we saw in the last three decades. That has made it much more difficult to get high sustained performance.

Olds: Where do you see HPC headed in the future? Is there anything that has you particularly excited or concerned?

Resch: [Laughs] I'm always excited and concerned. That's just normal. That's what happens when you go into science and that's normal when you work with supercomputers. I see, basically, two things happening. The first thing is that people will merge everything that has to do with data and everything that has to do with simulation. I keep saying it's data analytics, machine learning, artificial intelligence. It's sort of a development from raw data to very intelligent handling of data. And these data-intensive things start to merge with simulation, like we see people trying to understand what they did over the last 20 years by employing artificial intelligence to work its way through the data trying to find what we have already done and what should we do next, things like that.

The second thing that is exciting is quantum computing. It's exciting because it's out of the ordinary, in a sense. You might say that over the last 32 years the only thing I did was work with improved technology and improved methods and improved algorithms or whatever, but I was still working in the same John von Neumann architecture concept. Going to quantum computing we have to throw away everything and we have to start anew. This is a great time. I keep telling my Ph.D. candidates, go for quantum computing. This is where you make an impact. This is where you have a wide-open field of things you can explore and this is what is going to make the job exciting for the next 10, 12, 15 years or so.

Olds: That's fantastic and your enthusiasm for this really comes through. Your enthusiasm for HPC, for the new computing methods, and all that. And, thank you so much for taking the time.

Resch: It was a pleasure. Thank you.

Olds: Thank you, really appreciate it.

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Hyperion Research provides data-driven research, analysis and recommendations for technologies, applications, and markets in high performance computing and emerging technology areas to help organizations worldwide make effective decisions and seize growth opportunities. Research includes market sizing and forecasting, share tracking, segmentation, technology and related trend analysis, and both user & vendor analysis for multi-user technical server technology used for HPC and HPDA (high performance data analysis). We provide thought leadership and practical guidance for users, vendors and other members of the HPC community by focusing on key market and technology trends across government, industry, commerce, and academia.

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