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DARPA Selects Four To Develop Super Computer

By Ashok Bindra
TMCnet Contributor

Supercomputers and high-speed number crunchers have been the backbone of national security and defense systems. And, until now, they have served these applications adequately. But, going forward, new generation of advanced DoD systems and defense applications are demanding radical improvements in state-of-the-art processing power with unprecedented energy efficiency. To meet the escalating demands for greater processing performance, DoD's Defense Advanced Research Projects Agency (DARPA) has initiated the Ubiquitous High Performance Computing (UHPC) program to create an innovative, revolutionary new generation of exascale computing system that overcomes the limitations of current evolutionary approach.

Modern computing performance increases have been driven by Moore's law (doubling the transistors that can be placed on an integrated circuit every two years). The ability to achieve projected performance gains is limited by significant power consumption, architectural and programming complexity issues. To exploit available technological advances fully, highly programmable high performance computers must be developed that require dramatically less energy per computation.

Hence, the goal of DARPA's UHPC program is to develop radically new computer architectures and programming models that are 100 to 1,000 times more energy efficient, with petaflop level performance, and are easier to program than current systems.

Prototype UHPC systems are expected to be complete by 2018. The four performers selected to develop UHPC prototype systems are Intel Corp., NVIDIA Corp. (News - Alert), Massachusetts Institute of Technology (MIT) Computer Science and Artificial Intelligence Laboratory, and Sandia National Laboratories. Additionally, Georgia Institute of Technology (News - Alert) has been asked to create an applications, benchmarks and metrics team for evaluating the UHPC systems under development.

While Intel (News - Alert) has yet to reveal the team members, NVIDIA has already announced its team, which includes Cray, Oak Ridge National Labs, and six top U.S. Universities. For that, it has been awarded a research grant of $25 million by DARPA. The research team plans to develop new software and hardware technology to dramatically increase computing performance, programmability and reliability.

In a statement, NVIDIA's chief scientist and senior vice president of research, and the team's principal investigator Bill Dally stated, "This recognizes NVIDIA's substantial investments in the field of parallel processing and highlights GPU computing's position as one of the most promising paths to exascale computing." "We look forward to collaborating to develop programmable, scalable systems that operate in tight power budgets and deliver increases in performances that are many orders of magnitude above today's systems," noted Dally.

Similarly, Sandia's partners include Micron Technology (News - Alert) Inc. and LexisNexis Special Services Inc. On the academic side, the partners are Louisiana State University, University of Illinois at Urbana-Champaign, University of Notre Dame, and University of Southern California. However, Sandia did not disclose the research grant awarded.

Besides offering HPC architecture design, system software development, microelectronics expertise in 3D packaging and silicon photonics, Sandia team also brings application and algorithms development expertise to the UHPC co-design process.

According to James A. Ang, Department Manager, Scalable Computer Architectures, Sandia National Labs, "Our X-caliber architecture is targeted at providing revolutionary data movement

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performance while meeting the power and energy, programmability and dependability challenges that are addressed by the DARPA UHPC program."

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Edited by Erin Monda

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