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## **Application Acceleration for Titan: The Importance of Realizing Hierarchical Parallelism in the Hybrid Multicore Era**

### **Abstract**

The Oak Ridge Leadership Computing Facility (OLCF) has recently announced the intent to deploy a 10-20PF-peak platform in the near future (OLCF-3). The OLCF-3 system will be a hybrid multi-core node based system for use as a major compute resource for DOE's Office of Science. The nodes on this system will have an industry standard x86-64 architecture processor paired with a GPU-based application accelerator. This new node architecture will require application teams to modify their codes to take advantage of the accelerator and thereby realize most of the computational power of the platform. Accordingly, the OLCF has selected 6 vanguard applications for porting to OLCF-3 and has established a Center for Accelerated Application Readiness (CAAR) to collect expertise and resources to facilitate these ports. We describe some of the lessons learned from this exercise and provide the CAAR vision for an effective programming model for OLCF-3, as well as subsequent machines.

### **Biosketch**

Bronson Messer is a Senior R&D Staff Member in the Scientific Computing group at the National Center For Computational Sciences (NCCS) at ORNL, where he currently serves as acting Group Leader. He has experience with large-scale supernova (both thermonuclear and core-collapse) simulations on a variety of platforms, including the Intel Paragon, the IBM Power family, the Cray C90, SV-1, X1E, XT3, and several others. In addition, he has worked on methods for nuclear network calculations and the application of genetic algorithms to the analysis of galaxy merger simulations. He previously served as the acting Director of Science for the NCCS from 2010 until the summer of 2011. Prior to joining the NCCS, Dr. Messer was a Research Associate in the Department of Astronomy & Astrophysics at the University of Chicago, where he was Deputy Group Leader for Astrophysics in the ASC Center for Astrophysical Thermonuclear Flashes. Prior to that appointment, Dr. Messer was a Research Associate with the Terascale Supernova Initiative at ORNL and the University of Tennessee. Dr. Messer holds undergraduate and graduate degrees from the University of Tennessee, earning his PhD in physics in 2000.