

Performance Analysis and Optimization of HPC Applications

Performance analysis and optimization has been and continues to be of great practical and theoretical importance in the design, development, and optimization of systems and applications. In the past decade computing technologies have been advanced dramatically. For instance, teraflop computers, capable of executing one trillion (10^{12}) floating point operations per second (TFlops), have emerged. Petaflop systems (10^{15}) are expected by the end of the decade. However, many parallel applications cannot fully utilize the vast computing power provided by massively parallel computers due to a number of performance bottlenecks in these applications. How to efficiently optimize and scale these applications so as to make them take full advantage of large-scale systems is a challenging problem. In this project, we are focused on designing and developing optimization techniques to substantially improve the performance and scalability of real-world applications on massively parallel systems. Various performance tools are used in this work, including [Prophesy](#). This work is conducted in collaboration with application developers from various disciplines.

Members:

- Zhiling Lan
- Yawei Li
- Jungmi Lee
- Zongjie Cui
- Prathibha Deshikachar

Collaborators:

- Valerie Taylor (TAMU)
- Panagiotis Spentzouris & James Amundson (FNAL)
- Michael Norman (UCSD)
- Greg Bryan (Columbia Univ.)

Publications:

- J. Lee, Z. Lan, J. Amundson, and P. Spentzouris, "Evaluating Performance and Scalability of Advanced Accelerator Simulations", *Proc. of IEEE/ACM International Symposium on Cluster Computing and the Grid (CCGrid06)*, Singapore, 2006.
- Z. Lan, Y. Li, and J. Lee, "Exploring Large-scale Applications on TeraGrid", *The First Annual TeraGrid Conference*, 2006.
- V. Taylor, X. Wu, J. Geisler, X. Li, Z. Lan, R. Stevens, M. Hereld and I. Judson, "Prophesy: An Infrastructure for Analyzing and Modeling the Performance of Parallel and Distributed Applications", *Proc. HPDC 2000*.
- Z. Lan and P. Deshikachar, "Performance Analysis of a Large-Scale Cosmology Application on Three Cluster Systems", *IEEE Cluster03*, 2003.

Contact:

Dr. Zhiling Lan (lan AT iit DOT edu)