

## System Software: A Necessary but Ill-prepared Hero

### Abstract:

Several trends in high performance computing make applications far more dependent on and concerned with system software design and performance. In the era of scalable MPI-only systems, many application developers did not place a high priority on optimizing single node performance since inter-node scalability was more heavily scrutinized. In fact, too much improvement in single node performance could be “bad news” for extreme application scalability.

Now and in the future, most application performance scaling must come from intra-node parallelism. Even so, intra-node parallel programming and execution environments are deficient, evolving in multiple uncoordinated and competitive directions and suffer from a lack of common abstraction models that the community can use to communicate with each other and reason about algorithm and software design.

In this presentation, we discuss some of the deficiencies of current system software, especially the challenges applications face in trying to obtain scalability on current manycore and accelerator-based nodes. We then discuss trends in architecture that must be exploited by applications, with assistance from system software. Finally we discuss some basic requirements applications will place on system software and constraints our algorithms place on some popular ideas for extracting more parallelism from applications.