Next generation programming environments: What we need and do not need

Michael A. Heroux
Sandia National Laboratories

The present changes in computer architecture—especially node level parallelism and extremely large component counts—admit the potential for radical changes in programming environments. Our notions of abstract machine and execution models, demands on the underlying runtime system, and the programming languages and libraries we will use are all being reconsidered.

In this talk we present some fundamental requirements any emerging programming environment should meet. We specifically address (i) programmability requirements for domain scientists who are not parallel programming experts, (ii) expressiveness requirements for work and data placement, (iii) some limitations on dynamic parallel execution, (iv) needs for expressing resilient computations and (v) requirements any new programming environment must meet in order to supplant incumbents.

We will also propose some elements of what a new abstract machine and execution model might contain. Finally, we will discuss what we do not want from a new programming environment, a contrasting description related to the above themes.