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Runtime Methods to Improve Energy Efficiency in HPC Applications

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Entrada libre hasta completar el aforo

Resumen:

The principal means to increase performance of modern high performance computing (HPC) applications is to use more processors in parallel. However, energy use increases linearly with the number of processing cores. Energy costs for top supercomputers already exceed 10M EUR per year, and the operating costs and carbon footprint of next generation systems (exaflop scale) are a major concern.
HPC applications use a parallel programming paradigm like the Message Passing Interface (MPI) to coordinate computation and communication among thousands of processors. With dynamically-changing factors both in hardware and software affecting energy usage of processors, there exists an opportunity for power monitoring and regulation at runtime to achieve savings in energy.
In this talk, an adaptive runtime framework is described that enables processors with core-specific power control to reduce power with little or no performance impact. Two opportunities to improve the energy efficiency of processors running MPI applications are identified - computational workload imbalance and memory system saturation.

Sobre Jans F. Prins:

Jan F. Prins is a Professor in the Department of Computer Science at the University of North Carolina at Chapel Hill (USA). As an undergraduate in Mathematics in 1976, he was a co-founder of Digital Effects Inc., one of the first computer animation companies. Sample productions include portions of the original Disney film “TRON (1982). He obtained his Ph.D. in 1987 in Computer Science from Cornell University on the formal derivation of programs from specifications. Since 1987, he has been a member of the computer science faculty at UNC-Chapel Hill, and a member of the bioinformatics and computational biology training program and the curriculum in molecular and cellular biophysics. His research interests center on parallel computing specifically and computational biology more generally. In the last decade he has focused on challenges in transcriptomics.