DEEP: Dynamical Exascale Entry Platform

Description

DEEP developed a novel, Exascale-enabling supercomputing platform along with the optimisation of a set of grand-challenge codes simulating applications highly relevant for Europe's science, industry and society.

The DEEP System realised a Cluster Booster Architecture that can cope with the limitations purported by Amdahl's Law. It served as proof-of-concept for a next-generation 100 Petaflop/s PRACE production system, striving for independent provision of HPC technology, in particular general purpose Exascale performance supercomputers in Europe.

The DEEP concept was based on the duality of an advanced multi-core Cluster system with InfiniBand interconnect complemented by a Booster of Intel many-core MIC processors connected through a Terabit EXTOLL network. A novel open source system software stack along with Cluster Booster adapted programming models, libraries, and performance tools will achieve high productivity and will enable unprecedented scalability on millions of cores. The DEEP hardware and software technology was developed in Europe while the new many-core processor is an essential component of international cooperation.

The DEEP concept can improve the power efficiency of HPC systems by an order of magnitude. Its innovative cooling concept allows approaching power usage effectiveness values very close to representative HPC codes from Health and Biology, Climatology, Seismic Imaging, Industrial Design, Space Weather, and Superconductivity were optimised on DEEP and the extrapolation to millions of cores was demonstrated.

The pan-European DEEP consortium has proven competence to meet the project's massive technological and scientific challenges. DEEP disseminated knowledge amongst major European industrial stakeholders and the entire PRACE consortium through its technical advisory group STRATOS and contributed to the vision of the PROSPECT association for a European HPC technology platform.

Barcelona Supercomputing Center - Centro Nacional de Supercomputación