

The INFN COSA project experience and low power computing and storage

Lucia Morganti, Daniele Cesini, Andrea Ferraro,
Elena Corni, Antonio Falabella, Luca Lama

Italian Institute for Nuclear Physics - INFN,
CNAF Dept., Bologna, Italy

Abstract

In the context of energy efficient “green” computing, we present the experience of the COSA project (Computing On SoC Architecture, www.cosa-project.it), started in 2014 and funded by the Italian Institute for Nuclear Physics (INFN). COSA explores the feasibility of executing scientific workloads, which are traditionally designed for power-hungry HPC clusters, on the CPUs and GPUs of low-power Systems of Chip derived from the embedded and mobile market, looking for a better trade-off between time-to-solution and energy-to-solution. In a laboratory based at CNAF (INFN, Bologna), COSA has assembled an unconventional cluster of SoCs from ARM and Intel vendors, interconnected through 1Gb/s 10Gb/s Ethernet switches, where several scientific workloads were ported and successfully executed. Depending on the nature of the applications, and in particular for those which manage to exploit the GPU power, SoCs proved able to deliver satisfactory computing performances, in some cases comparable with those provided by a node of an HPC standard cluster, for the benefit of much lower power consumptions and, noticeably, reduced infrastructural costs and sizes. We show the results obtained for significant workloads from the Particle physics, X-Ray computed tomography, Statistical biology and Theoretical physics fields. Moreover, we investigate the possibility of using SoCs, and in particular Intel Xeon processors from the D family, as low-power, low-cost storage bricks of a BeeGFS file system, in the perspective of energy-efficient storage solutions which could be deployed in or out of data centers.