SC BoF ETP4HPC – Input DEEP-ER

Input Handbook - 2016

Comment [SE1]: @Marcin: This can stay exactly as is – so this is the 2015 version with no changes

Project Profile
The DEEP project and its follow-up project DEEP-ER present an innovative solution for next generation supercomputer addressing various Exascale challenges by following a stringent Co-Design approach. The consortium has developed a novel, Exascale-enabling supercomputing architecture with a matching software stack and a set of optimized grand-challenge simulation applications.

DEEP takes the concept of compute acceleration to a new level: instead of attaching accelerator cards to cluster nodes, DEEP has built a cluster of accelerators, called Booster, to complement a conventional HPC system and increase its compute performance. Accompanied by a software stack focused on meeting Exascale requirements - comprising adapted programming models, libraries and performance tools - the architecture enables unprecedented scalability. The cluster-level heterogeneity of the system attenuates the consequences of Amdahl's law allowing users to run applications with kernels of high scalability alongside kernels of low scalability concurrently on different sides of the system.
DEEP-ER advances the Cluster-Booster architecture developed in DEEP from a hardware point of view in terms of processor technology, network interconnect, and storage. On the software side DEEP-ER focuses on two central research topics: highly scalable parallel I/O and resiliency.

Both DEEP and DEEP-ER validate their concepts on the prototype systems built within the projects. The DEEP prototype system with a peak performance of 500 TFlop/s is already up and running at Jülich Supercomputing Centre.

Which areas does your project target?
HPC core technologies and architecture
Programming methodologies, environments, languages and tools
APIs and system software for future extreme scale systems

What areas of your project do you think have a potential for cross-continent synergies?
HPC core technologies: the Cluster-Booster concept can be generalised into a modular approach for HPC. Different components are combined to provide the system functionalities exploiting the best characteristics of each technology.
Prototype development: exchange of lessons learned.
Programming models and application porting: the DEEP programming model is based on standards (MPI and OpenMP) and has been designed to make application porting between platforms as seamless as possible.
Application scientists: invited to test their codes on the DEEP System. Exchange of experience in code modernisation.

New questions:

1) **Main achievements of your project in 1 sentence**

   The DEEP and DEEP-ER consortium has developed a novel, Exascale-enabling supercomputing architecture with a matching software stack and a set of optimized grand-challenge simulation applications.

2) **Please summarize in one sentence the potential areas of international collaboration of your project**
   - For DEEP and DEEP-ER it would be very valuable to get feedback from a diverse group of application scientists on how to use and to benefit from the Cluster-Booster architecture.

3) **What future partners are you looking to collaborate with?**
   - Application developers / domain scientists

4) **How could EXDCI (or other supporting initiatives) help in this process? What tools/mechanisms would you like to see put in place (e.g. joint workshops, joint calls, etc.)? (The objective of the following question is to help us to prepare the interactive part of the discussion and define future actions.)**
   - Joint workshops & trainings
   - Build-up a database for collaboration (interested projects can look up contacts by keyword search and see if other projects would be a match)