

DEEP-SEA: DEEP SOFTWARE FOR EXASCALE ARCHITECTURES

Description

DEEP-SEA (DEEP Software for Exascale Architectures) will deliver the programming environment for future European exascale systems, adapting all levels of the software (SW) stack including low-level drivers, computation and communication libraries, resource management, and programming abstractions with associated runtime systems and tools to support highly heterogeneous compute and memory configurations and to allow code optimisation across existing and future architectures and systems.

At node-level the European Processor Initiative (EPI) will integrate general purpose CPUs and accelerators within the package and combine DDR and HBM memories. Consequently, DEEP-SEA will implement data placement policies for deep memory hierarchies, improving application performance on future EPI-based platforms. At system-level, CPUs and accelerators (e.g., various EPI chip configurations, or GPUs) are efficiently integrated following the Modular Supercomputer Architecture (MSA). The DEEP-SEA SW stack will enable dynamic resource allocation, application malleability, programming composability, and include tools to map applications to the MSA. Result is a SW environment enabling applications to run on the best suited hardware, in a scalable, and energy efficient manner.

Targeting a high Technology Readiness Level (TRL), the project builds upon SW developments from previous EU-projects and international open source packages widely used in the HPC community, extending them with focus on compute and memory heterogeneity. This enables close collaborations within the HPC community and Centres of Excellence (CoEs). The DEEP-SEA SW elements will be extended in a collaborative co-design approach with EU-applications, considering relations and dependencies between the various levels of the stack. Therefore, ambitious and highly-relevant EU-applications will drive the co-design, evaluate the DEEP-SEA software stack, and demonstrate its benefits for users of European compute centres.

Barcelona Supercomputing Center - Centro Nacional de Supercomputación

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