Building a path to extreme-scale computing

July 1 2020

Credit: Zen Chung from Pexels

High-performance computing (HPC), typically used for solving advanced problems through modeling, simulation, and analysis, is increasingly deployed in scientific and engineering research. In addition to compute-intensive simulations, the demand for applications like Big Data analytics and sophisticated visualizations is also growing rapidly.

However, it can be challenging for supercomputer architectures to handle these tasks efficiently.

Enter the EU-funded DEEP-EST project that is creating an energy-efficient system architecture to fit HPC and high-performance data analytics workloads. To achieve this, project partners are building a fully working Modular Supercomputing Architecture system prototype consisting of three modules: the cluster module, the data analytics module, and the extreme-scale booster module. "Creating a modular supercomputer that best fits the requirements of the diverse, increasingly complex, and newly emerging applications is the aim of DEEP-EST," as stated on the project website.

According to a news release, project partner MEGWARE has announced "that with the delivery and installation of the last of its three modules, the build-up of the DEEP-EST prototype system is now complete. Based on the Modular Supercomputing Architecture (MSA) developed by Jülich Supercomputing Center, it features a general-purpose Cluster Module (CM), a focused Data Analytics Module (DAM) and an Extreme Scale Booster (ESB) module, all connected with high speed via a Network Federation."

The same news release notes that the prototype "features state-of-the-art high-performance technologies for compute (CPU), acceleration (GPGPU, FPGA), memory (volatile, non-volatile), SSD [solid-state drive] storage, I/O [input/output], and network fabrics to support modern HPC, Data Analytics and AI workloads." In addition, it uses "MEGWARE's innovative direct liquid (warm water) cooling ColdCon technology for high energy efficiency and sustainability, thus supporting the EU European Green Deal strategy."

Early access

The ongoing DEEP-EST (DEEP—Extreme Scale Technologies) project builds on technologies and concepts developed by its predecessors: DEEP (Dynamical Exascale Entry Platform) and DEEP-ER (DEEP Extended Reach). Exascale involves computer systems or applications that could deliver at least one exaFLOPS, or a billion billion operations per second. A measure of computer speed, FLOPS refers to the number of floating-point operations per second that can be performed by a computer.

The developed MSA "is a blueprint for large-scale heterogeneous systems supporting the different requirements of HPC, Big Data Analytics and Machine Learning with highest efficiency and scalability," as explained on the project website. The MSA combines diverse compute modules with different performance features into a single system. These are connected through a high-speed network and are operated "with a uniform system software and programming environment. In this way, one application can be distributed over several modules, running each part of its code onto the best suited hardware," according to the project website.

The DEEP-EST project will run until March 2021. Its prototype system is available to academic and industrial users through the Early Access Program (EAP), including those performing COVID-19-related research activities. Information on the EAP and the application process is available on the project website.

More information: Towards a Modular Supercomputing Architecture for Exascale: www.deep-projects.eu/

Provided by CORDIS