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ExaSCALE Computing Leadership Act of 2015

The ExaSCALE Computing Leadership Act of 2015 will create partnerships between national laboratories, industry and universities to develop exascale computing architectures.

Exascale computers will be capable of at least one exaFLOPS, or a billion billion calculations per second. This is a thousand-fold increase over the current petascale computers which have been in operation since 2008.

The ExaSCALE Computing Leadership Act is the first step in establishing the technologies that are needed to achieve practical exascale computing goals. Achieving "exascale" will require an overhaul of how these machines compute, move data, and are programmed.

The first country to achieve exascale computing will gain a significant competitive intellectual, technological, and economic advantage. International competitors already have plans to achieve exascale by the end of this decade. The European Union doubled its annual investment in supercomputing, and China – which currently has the world's fastest supercomputer – is aggressively increasing investments in hardware and software to build the next generation of supercomputers.

Exascale computing is necessary to achieve the next stage of predictive simulation and analytics to advance scientific discovery, engineering design, and national security. Breakthroughs in several areas could be achieved with the help of exascale high-resolution 3D simulations, such as:

- improving nuclear weapon performance
- developing advanced safeguard instruments for non-proliferation
- increasing the speed of design, engineering and manufacturing of better-performing, more-efficient commercial and military aircraft, automobiles, trucks and spacecraft
- making nuclear power safer by expanding reactor core physics models to entire power plant scale, and
- advancing our understanding of the human brain by providing the computing power to successfully model the human brain at the neural level.

Goals of Legislation

- Develop exascale computing architectures for Science, Competitiveness, Advanced Manufacturing, Leadership, and the Economy (ExaSCALE).
- Allows the Secretary of Energy to competitively select two or more National Laboratory-industry-university partnership to research and develop two or more approaches for achieving practicable exascale computing architectures.
- Ensure that future exascale computing machines will be able to solve large scientific problems by utilizing "codesign methodology" that brings together hardware, software and algorithm development. This is necessary to overcome the challenge of writing software applications that work for hundreds of thousands of CPUs running in parallel.

Authorization of Appropriations

- Authorizes funding, subject to annual appropriations, to ensure the project is meeting the goals established by Congress.