

MEMORANDUM OF UNDERSTANDING
BETWEEN
THE U.S. DEPARTMENT OF ENERGY, OFFICE OF SCIENCE
AND
THE U.S. DEPARTMENT OF ENERGY, NATIONAL NUCLEAR SECURITY
ADMINISTRATION, OFFICE OF DEFENSE PROGRAMS
FOR THE COORDINATION OF EXASCALE ACTIVITIES

1.0 Purpose

The purpose of this Memorandum of Understanding (MOU) is to define the agreement between the Department of Energy (DOE) Office of Science (SC) and the DOE National Nuclear Security Administration (NNSA), Office of Defense Programs (DP) regarding the coordination of Exascale activities in the two organizations. These activities are focused on driving U.S. scientific discovery and economic competitiveness by enabling high performance scientific computing on the new generation of computers. These computers support representative DOE mission areas such as combustion, climate, nuclear energy, and national security. Both SC and DP have numerous interests in advanced High Performance Computing (HPC) that can be best served by coordination and collaboration. This MOU builds on existing cooperation between the two organizations within DOE to facilitate maximum impact of the Department's investments in this area. The details for joint planning and joint coordination and management of applications, co-design, and enabling technologies, including – research, development, engineering, test and evaluation, and acquisition activities – under this initiative will be provided in a separate Program Execution Plan that will be jointly developed and updated on an as needed basis by SC and DP.

2.0 Background

The past three decades of national investments in applied mathematics, computer science, and HPC have placed the DOE at the forefront of many areas of computational science, and prepared it to undertake this effort. In addition, under the leadership of DOE (SC and DP), computers and essential technologies necessary for HPC have been developed and have dominated the International Top500 list of high performance computers since its inception in 1993. Today, more than fifteen years after the first petascale workshops were convened, the predictions of scientific accomplishments from petascale computing resources are a reality, and systems achieving a sustained petaflop/s are sited at Oak Ridge National Laboratory and Los Alamos National Laboratory. The ambitious science and national security mission goals of SC and DP have been enabled by the HPC capabilities brought to bear by the Office of Advanced Scientific Computing Research (ASCR) and The Office of Advanced Simulation and Computing (ASC).

The scientific challenges of this decade in many scientific and engineering domains of national importance cannot be achieved without Exascale (or greater) computing capability. This advanced capability is needed to attack the complexity of the problems, the interactions between length and time scales, and the need for detailed understanding of uncertainties in

the results. The use of these powerful, world-class computational tools can and will lead to critical and unanticipated discoveries important to science, energy assurance, and national security.

Over the past two years, DOE program offices have held a series of ten workshops to identify critical scientific and national security grand challenges and to explore the impact a thousand-fold increase in modeling and simulation computing capability could have on these challenges. The SC and DP have identified activities that leverage their respective experience, technical and management expertise, and resources to deliver on a critical capability for the Department and for the Nation.

The SC and DP have developed a tightly coordinated portfolio of activities with the goal of delivering a thousand-fold increase in computational capability to key DOE mission and basic science application areas by the end of the decade. At the highest level, these activities will integrate the following elements:

- Research in advanced scientific applications and integrated application-hardware-software co-design to both enable the applications to make the transition to the future systems and enable the applications to inform and influence the following elements;
- Partnerships with U.S. computer and semiconductor vendors to impact the design of future systems for power efficiency, capability, and suitability for DOE applications;
- Research in advanced software and computing environments that will be required to enable DOE applications to take advantage of the radically different hardware that will be available by the end of the decade; and
- Installations of prototype and final Exascale platforms to enable scientific advancements leading to new levels of mission achievements.

3.0 Scope

This MOU provides a framework for cooperation and coordination and is not intended to be an exhaustive description of work to be carried out over the term of the MOU. Further details of SC and DP Exascale activities will be provided in the jointly developed Program Execution Plan.

While both SC and DP have many interests that are well served by coordination and collaboration, only Exascale activities are in scope for this MOU.

For SC, the scope of focus under this MOU is on research, development, engineering, test and evaluation, and acquisition activities related to high-end scientific and technical computational activities funded or supported by ASCR and conducted within the SC national laboratories and NNSA national laboratories.

For DP, the focus is on research, development, engineering, test and evaluation, and acquisition activities related to high-end scientific and technical computational activities funded or supported by ASC and conducted within the NNSA national laboratories and SC national laboratories.

Components that will be coordinated jointly by ASCR and ASC under this MOU include:

3.1 Co-Design and Advanced Applications

Research in advanced scientific applications and integrated application-hardware-software co-design to both enable the applications to make the transition to the future systems and enable the applications to inform and influence platform technologies and software environments. Co-design activities will address critical Department missions in energy, the environment, and security.

3.2 Platform and Critical Technology Research and Development

Research and Development (R&D) partnerships with the HPC, semiconductor, storage, and other critical technology manufacturers, including HPC vendor R&D partnerships and critical technologies research.

3.3 Software and Environments R&D

Research in advanced software and environments that will enable DOE applications to take advantage of radically different hardware to support Exascale computing.

3.4 Platforms

Installations of prototype and final Exascale platforms to enable new scientific accomplishments, including prototypes and platforms for classified research, as well as prototypes and platforms for open scientific research.

4.0 Oversight and Coordination

4.1. Exascale Joint Coordination Group:

The Exascale Joint Coordination Group will be established to coordinate the activities within the scope of this MOU and will be further defined in the Joint Program Execution Plan. The purpose of the Exascale Joint Coordination Group is to help ensure activities are conducted as planned, to ensure effective and responsible use of government funds, minimize confusion of multiple lines of authority and reporting, and leverage existing infrastructure and resources.

The Exascale Joint Coordination Group will be co-chaired by DP's Director of ASC, and SC's Director of ASCR. Additional group membership will be determined by the co-chairs.

Functions of the Exascale Joint Coordination Group shall include:

- Providing long-term program leadership, vision, and execution oversight;
- Developing mission requirements, goals, objectives, and execution plans;
- Coordinating interactions and feedback between exascale elements including day-to-day planning, management, and budgetary oversight needed to ensure that joint DP-SC program objectives are being met and progress is being made on all milestones;

- Establishing advisory groups, as needed, within existing rules and authorities;
- Establishing efforts to build and train the large and diverse user community for the incoming Exascale systems; and
- Reporting to DOE senior management the status of and progress towards, program goals and major deliverables. DOE senior management includes the DOE Director of SC, the NNSA Deputy Administrator for DP, the DOE Under Secretary for Science, and the NNSA Administrator.

5.0 Roles and Responsibilities

The basic roles and responsibilities agreed upon by SC and DP are described in this MOU. Detailed roles and responsibilities will be established in the Joint Program Execution Plan.

5.1 SC-ASCR Responsibilities

- 5.1.1 The ASCR Director will serve as a co-chair of the Exascale Joint Coordination Group.
- 5.1.2 ASCR will plan and execute the Exascale activities that it is responsible for as agreed to in the Joint Program Execution Plan, subject to availability of appropriated funds.
- 5.1.3 ASCR will develop and help defend the annual budget request to Congress for the ASCR supported Exascale activities, consistent with the budget profiles agreed to between SC and DP in the Joint Program Execution Plan, and consistent with availability of appropriated funds.

5.2 DP-ASC Responsibilities

- 5.2.1 The ASC Director will serve as a co-chair of the Exascale Joint Coordination Group.
- 5.2.2 ASC will plan and execute the Exascale activities that it is responsible for as agreed to in the Joint Program Execution Plan, subject to availability of appropriated funds.
- 5.2.3 ASC will develop and help defend the annual budget request to Congress for the ASC supported Exascale activities, consistent with the budget profiles agreed to between SC and DP in the Joint Program Execution Plan, and consistent with availability of appropriated funds.

5.3 Joint Responsibilities

- 5.3.1 Research and Development

- A. ASCR and ASC will coordinate co-design activities and jointly support unclassified applications of joint interest.
- B. ASCR and ASC will jointly support R&D in:
 - i. HPC R&D partnerships through the DOE laboratories;
 - ii. Critical technologies research; and
 - iii. Systems software and programming environment research efforts.
- C. ASCR and ASC will coordinate and collaborate on internal and external peer reviews of activities supported under this MOU.

5.3.2 Communication and Coordination with the Broader Community

- A. ASCR and ASC will acknowledge the joint collaborative activities under this MOU in relevant publications.
- B. ASCR and ASC will engage other government agencies, as required, to leverage government investments related to Exascale activities.
- C. ASCR and ASC will engage in joint communication and coordination with the broader scientific and technical community regarding Exascale activities, including sharing knowledge with other agencies and the broader community by co-organizing and co-sponsoring joint technical workshops and meetings.
- D. ASCR and ASC will continue to jointly participate in formal, yearly planning meetings with the Department of Defense.
- E. ASCR and ASC will engage international agencies, as appropriate, to advance the DOE's Exascale goals.

6.0 Terms of Agreement

6.1 Participating Parties

The SC point of contact shall be the Director of ASCR. The DP point of contact shall be the Director of ASC.

6.2 Funding

Specific proposed funding commitments by the parties will be described in the Joint Program Execution Plan. All activities under or pursuant to this MOU are subject to the availability of appropriated funds, and each organization's budget priorities.

DP and SC will provide each other mutual support in making budget justifications to OMB and in preparing for hearings before Congress with respect to programs on which the parties collaborate.

6.3 Administration

This MOU in no way restricts the parties from participating in any activity with any other public or private agencies, organizations or individuals. This MOU is strictly for internal management of the Exascale activities. It is not legally enforceable and shall not be

construed to create any legal obligation on the part of the parties. This MOU shall not be construed to provide a private right or cause of action for or by any person or entity.

6.4 Authorizations

DOE is authorized to enter into this MOU for cooperation and collaboration on research and development initiatives that support the Department's mission pursuant to general authorizes under Section 31 of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2051), Section 107 of the Energy Reorganization Act of 1974 (42 U.S.C. 5817), and Section 646 of the Department of Energy Organization Act (42 U.S.C. 7256). Further, DOE is authorized to enter into this MOU involving HPC in scientific research and development activities pursuant to Section 976 of the Energy Policy Act of 2005 (42 U.S.C. 16316), which directs the Department to carry out HPC research and development efforts consistent with the Department of Energy High-End Computing Revitalization Act of 2004 (15 U.S.C. 5541 et seq.) and the High-Performance Computing Act of 1991 (15 U.S.C. 5523), as amended.

For this internal MOU, NNSA is further authorized pursuant to Title 32 of the National Defense Authorization Act for Fiscal Year 2000 (Public Law 106-65).


7.0 Effective Date

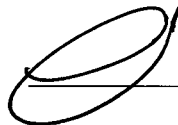
This MOU is effective upon signature by all parties. It shall remain in effect for five years beginning on its effective date. The MOU may be renewed for additional periods to be determined upon mutual agreement of the parties.

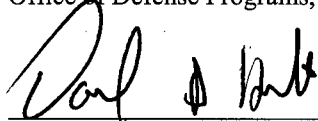
8.0 Amendment and Termination

This MOU may be amended at any time by mutual agreement of the parties. The MOU will be reviewed every five (5) years to determine whether it should be renewed and whether changes are needed. The MOU may be terminated at any time by mutual agreement of the parties or unilaterally by either party provided that reasonable written notice is provided to the other party.

Submitted by:



Christopher D'Arcy
Assistant Deputy Administrator for Stockpile Stewardship
Office of Defense Programs, NNSA

 1/19/2011
Date

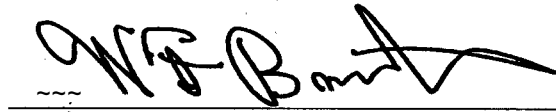

Daniel Hitchcock
Acting Associate Director, Office of Advanced Scientific
Computing Research
Office of Science, DOE

2/1/2011
Date

Concurred by:

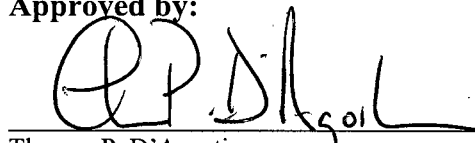

Donald L. Cook
Deputy Administrator for Defense Programs
National Nuclear Security Administration

1/26/2011
Date

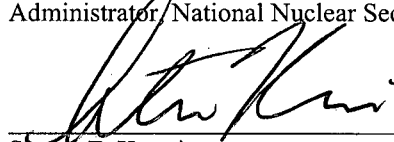

William F. Brinkman
Director, Office of Science
U.S. Department of Energy

4/1/2011
Date

Approved by:


Thomas P. D'Agostino
Under Secretary for Nuclear Security &
Administrator, National Nuclear Security Administration

4/13/11
Date


Steven E. Koonin
Under Secretary for Science
U.S. Department of Energy

4/11/11
Date